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MATERIA MEDICA,

PHARMACY, PHARMACOLOGY,

AND

THERAPEUTICS.

...Philadelphia, September, 18
...on the memory of the student, and as a quick re
perienced physician, who merely wishes a concise state
oint, the book is admirable. Evidently no pains have b
accurate, and its arrangement is scientific. It is the best
e market, and it has been made so in no slight degree b
nendations of the American editor.

From the New York Medical Record, December, 18
esented to the profession entirely remodeled according to
e Pharmacopœia. The authors are to be congratulated o
ice of this second edition, and this book well deserves a pl
every practitioner.

From the Southern Practitioner, October, 1894.—A mo
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actical and clear that the dull and monotonous subject of M
ally made attractive. The work of the American editor ha
tisfactorily executed, and the more recent remedial agen
-ahead country have not been overlooked.

From the Texas Courier-Record of Medicine, December
or and skill of the editor, the work has been thoroughly ad
American physicians. The editor's additions and correcti
noteworthy, and change the character of the work more or
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the text by the use of brackets. The book has thus b
a work of the highest practical value, almost every drug in
e most recent, having received due attention. The best r
recent developments in Therapeutics have been incorp
ox's labors have been performed with excellent judgment

From the Cleveland Medical Gazette, September, 1894.-
Dr. Wilcox has performed his work is conspicuous on
vident that no recent drug possessing any
e on the whole thi

believe that any work to be used or studied as a text book by the pharmacist or pharmacy student should conform in its statements to those given by the official standard in definition, description, solubilities, etc. And in this particular the editor is to be congratulated, for he has painstakingly and satisfactorily done his work. For study in the class-room or reference in the store, the book will certainly be appreciated. We know of none better.

From the Virginia Medical Monthly, November, 1894.—Both the author and the editor have the wonderful power of imparting instruction strikingly, so that it sticks to memory, so as to be made available at the bed side. We find the edition freed from the errors said to have crept in the first English edition, so that the book as now issued by the American publishers, is a better one than the English, and will make a first-class text-book for the practitioner or student.

From the Medical and Surgical Reporter, October, 1894.—It is a well-arranged and accurate text-book, especially in Therapeutics.

From the American Practitioner and News, December, 1894.—It is a real treat to pick up a work like this, full and compact, and giving evidence that the author and editor write with the confidence of experience and unbiased investigation.

From the Buffalo Medical and Surgical Journal, January, 1895.—We regard it as one of the best reference books a student can consult, and it is admirably adapted to the needs of the general practitioner of medicine. It embraces the more modern ideas of Materia Medica and Therapeutics, and will easily take rank among the best of its class. The second edition has been thoroughly revised, and some of it has been entirely re-written.

From the Chicago Medical Recorder, October, 1894.—In point of excellent arrangement, accuracy, conciseness, practical usefulness and completeness, this hand-book is without a peer. The author and editor both deserve congratulations.

From the Alumni Journal, New York, November, 1894.—Preparations into which articles or their preparations enter, though not mentioned in the list of preparations named in the Pharmacopœia, are carefully introduced. Secondly, the entire work abounds in italicized notes calling attention to errors or misunderstandings which experience has shown to be likely to arise in the work of either the pharmacist or the physician, and constitute a very important collection of danger signals. It will thus be seen that the second edition is made even more characteristically a *multum in parvo*, than its predecessor, and that properly used it must prove an invaluable aid to students of pharmacy.

***** The price of this book is $2.75 net in cloth binding, or $3 25 net in full leather. It may be obtained through any bookseller, or upon receipt of price will be sent, postpaid, to any address, by the publishers.**

MATERIA MEDICA

PHARMACY, PHARMACOLOGY

AND

THERAPEUTICS

BY

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MATERIA MEDICA

PHARMACY, PHARMACOLOGY

AND

THERAPEUTICS.

DEFINITIONS.

Materia Medica. [The materials used in the treatment of diseases.

Therapeutics. The application of remedial agents in the treatment of disease. It includes:

General Therapeutics. The application of curative agents other than drugs and medicines.] *E. g.*, diet, climate, baths, venesection.

Rational Therapeutics. [Therapeutics based upon Pharmaco-dynamics.] *E. g.*, the use of digitalis for mitral disease.

Empirical Therapeutics. [Therapeutics based upon clinical experiences only. *E. g.*, the use of colchicum for gout.]

In this work we shall consider only that part of Therapeutics which is concerned with drugs.

[**Pharmacology.** The study of Materia Medica and Therapeutics, including the origin, history, properties and uses of drugs and medicines. It includes:

Pharmacognosy. The study of the physical and chemical characters of drugs, and the art of identify-

ing and selecting them in accordance with those characters.

Pharmaco-Dynamics. The study of the action of remedial agents upon the organism of man, or the lower animals in a state of health.

Therapeutics. Although the correct definition of this term is as given above, yet it is, for want of a better one, often used as the name of the branch of study which deals with [illegible]. **Therapo-Dynamics** has been used in [illegible]se, but is faulty. **Experimental The[illegible]** [illegible]s been suggested, but is not comprehensi[illegible]

Toxicology. The st[illegible]ire, effects and detection of poisons, substances whic[illegible] into the body inopportunely or in excessive amo[illegible]able of destroying life. Courses of study and treati[illegible]ology are, for convenience, commonly made to [illegible]bject of antidotes and treatment, although this is, [illegible]ing, a part of Therapeutics.

Pharmacy. The art of preparing drugs in a form suitable for use as remedial agents and of dispensing them.

Pharmacopœia. A code of remedial agents, usually with descriptions, definitions or directions, prepared by experts appointed by an authority of some kind, and intended to serve as a standard until superseded by a new one. By admitting certain articles to its pages, it declares them to be of importance, through the extent of their use, or to be entitled to confidence because of their value, or both, in the practice of medicine, but does not, necessarily, deny these properties to articles not admitted. It fixes their official title or titles, and often their leading synonym or synonyms. Usually it defines them, describes them with sufficient completeness to provide for identification and determination of the proper degree of purity, or strength, or both, and details and recommends such operations in preparing them as pertain to a dispensing pharmacy. It may, in addition, fix or limit doses and provide rules, formulæ, tables, and

other information and directions of importance in the practice of pharmacy and medicine. It also fixes a date upon which its authority shall commence. Everything contained in the Pharmacopœia is said to be "official." Certain rules are followed for revising Pharmacopœias, as the advance in knowledge renders this desirable.

The United States Pharmacopœia (abbreviation "**U. S. P.**") is prepared by a committee, meeting at the beginning of each decade, consisting of delegates appointed by invitation extended by the President of the preceding Convention, to all incorporated medical and pharmaceutical societies and medical and pharmaceutical colleges, and to the United States Army and Navy and Marine Hospital Service. By Congressional action the **U. S. P.** is made a legal authority in the conduct of the Department of Customs, of the Army, Navy and Marine Hospital Service, and of the District of Columbia and other Territories within the jurisdiction of the United States laws. By legislative enactment it is also made a legal authority within the jurisdiction of many States. With these exceptions its authority is but moral. The last edition became official on January 1, 1894.] The abbreviation for "British Pharmacopœia" is "**B. P.**"

MATERIA MEDICA PROPER.

As much of this as the student need know will be mentioned under each drug.

PHARMACY.

[**Pharmacy** covers a field of nearly as much importance, breadth and difficulty as that of medicine itself, and requires as special, extensive and thorough a preparation. It should never be practiced by the physician, when the services of a competent manufacturing or dispensing pharmacist can be utilized. The physician should, however, be acquainted with the general principles and most details of the science and art of Pharmacy, that he may judge intelligently of the services rendered him by the pharmacist, and also be prepared to act with safety himself in

cases of emergency. A pharmaceutical education to this extent, accompanied by dispensary practice, should be provided for in every thorough course of medical study. The more important terms pertaining to Pharmacy are defined and explained below.

DEFINITION OF TERMS AS APPLIED TO SUBSTANCES OF VEGETABLE ORIGIN.

Alkaloids. (T s terminating in *ine*, their Latin names termin npounds of carbon, hydrogen and nitrogen, ining also oxygen, either existing in the pla inciples, or being derived from other alkaloid perties, and forming salts, usually crystallizabl out displacing any of the hydrogen of the lat aracters are as follows:

(1) Either
(*a*) solid, mostly cry rless, non-volatile, or
(*b*) liquid and volatile.]
(2) They turn red litmus paper blue.
[(3) They are soluble in alcohol, chloroform, benzin, benzol and often in ether. They are insoluble in water, but not so their salts, while the latter are insoluble in chloroform, ether, benzin and benzol.
(4) They are usually precipitated from saline solutions by alkalies.
(5) One or more of the following will precipitate them: tannic, phosphomolybdic or picric acid, potassio-mercuric iodide or auric chloride.]
(6) Their solutions are usually [intensely] bitter.
[Alkaloids are, as a class, the most energetic and important medicinal constituents of plants. Examples in U. S. P.: Atropine, Morphine, Strychnine.

Glucosides. (Their English names terminating in *in*, their Latin names terminating in *inum*.) Bodies which, heated with a diluted mineral acid and water, or by the action of a ferment, split up into glucose and some other substances. Examples in U. S. P.: Salicinum, Picrotoxinum.

Amaroids or Bitter Principles (their names ending in *in* and *inum* as above) are of such varied nature that they do not admit of any chemical diagnosis. The term includes all distinctly bitter extractives of definite chemical composition other than alkaloids and glucosides.

Glucosides and Amaroids are not the only principles whose names end in *in*.

Fixed Oils are ethers of the higher fatty acids which at ordinary temperatures remain liquid. The usual fatty acids entering into the composition of fixed oils are oleic, palmitic, and stearic.

Example: Olive oil consists of a mixture of a combination of oleic acid ($C_{18}H_{34}O_2$) with glyceryl (C_3H_5) and palmitic acid ($C_{16}H_{32}O_2$) with glyceryl. That is to say, ordinary olive oil is a mixture of two oils having the formulæ $C_3H_5(C_{18}H_{33}O_2)_3$ and $C_3H_5(C_{16}H_{31}O_2)_3$ respectively. When acted upon by caustic alkalies or metallic oxides they form soaps (oleates, palmitates, or stearates of metals) and glycerin. This process is called saponification, *e. g.*,

$$C_3H_5(C_{18}H_{33}O_2)_3 + 3NaOH = 3NaC_{18}H_{33}O_2 + C_3H_5(OH)_3.$$

Hard soap. Glycerin.
Sodium oleate.

Fixed oils are obtained by expression from the fruits or seeds of plants, or from animal tissues. When pure they are usually [colorless or pale] yellow; they float on water, and cause a greasy mark on paper. They are called fixed because they cannot be distilled without decomposition. They are soluble in ether, chloroform, turpentine and volatile oils.

[Those in U. S. P. are Oleum Amygdalæ Expressum, Lini, Morrhuæ, Olivæ, Ricini and Tiglii.]

Fats are fixed oils which are solid at ordinary temperatures; if extracted by expression, sufficient heat to melt them must be used.

[Examples in U. S. P.: Oleum theobromatis, Adeps.
The same definitions will apply to fixed oils and fats of animal origin.]

Volatile or Essential Oils only resemble fixed oils in being soluble in the same media. They do not leave a greasy mark on paper. They are mostly inflammable, and mostly lighter than water. They are highly aromatic, and sufficiently soluble in water to impart their odor and taste to it. They are prepared by distillation—that is, by passing a current of steam through the substance from which they are extracted, the steam is condensed, and the oil either floats to the top or sinks to the bottom of the

water. Their composition varies [greatly, and they are of four classes:

(*a*) **Terpenes**, which consist of carbon and hydrogen; *e. g.*, Oil of turpentine.

(*b*) **Oxygenated**, containing oxygen; *e. g.*, Oil of eucalyptus.

(*c*) **Sulphurated**, containing sulphur; *e. g.*, Volatile oil of mustard.

(*d*) **Nitrogenated**, [illegible] acid; *e. g.*, Oil of bitter almond.]

Elæoptens [the [illegible] *ene*] are liquid hydrocarbons isomeric with [illegible]

Stearoptens [t[illegible] ending in *ol*] are oxidized hydrocarbons u[illegible] ystalline.

[Examples in U. S. P[illegible] ol.]

Resins [are of ver[illegible] osition]. They are among the products of oxidati[illegible] ls, being usually oxidized terpenes. [They are s[illegible] crystallizable, fusible, not volatile, combustible, insoluble in water, mostly soluble in alkalies and volatile oils, and also in one or more of the following: alcohol, ether, chloroform, and fixed oils.] Those which combine with alkalies form resin soaps. Hence the alkali in Tinctura Guaiaci Ammoniata, and Tinctura Valerianæ Ammoniata. [When occurring naturally, there are usually two or more resins mixed.

The U. S. P. resins are Resina Copaibæ, Jalapæ, Podophylli, and Scammonii, Pix Burgundica, and Mastiche.]

Oleoresins are solutions of resins in volatile oils.

[Those in the U. S. P. are Oleoresina Aspidii, Capsici, Cubebæ, Lupulini, Piperis, and Zingiberis.]

Balsams, [a term used in several different ways. As to the U. S. P. articles, they are liquid or soft products containing resin, an odorous principle, and benzoic, or cinnamic acids, or both.

Those in U. S. P. are Balsamum Peruvianum, and Tolutanum, Benzoinum, and Styrax.

Resins containing benzoic or cinnamic acid are sometimes called solid balsams.]

Gums are exudations [having an insipid taste, insoluble in ether and alcohol, in water either dissolving to form a mucilage or swelling to form an adhesive jelly.] They consist of one or more of [the following]:

(*a*) Arabin or soluble gums, *e. g.*, Acacia.
(*b*) Bassorin or partially soluble gums, *e. g.*, Tragacantha.
(*c*) Cerasin or insoluble gum.

[Solutions of gum are precipitated by alcohol.]

Gum-resins are exudations from plants consisting of a mixture of one or more gums and one or more resins. When they are rubbed with water the gum dissolves and the resin remains mechanically suspended in the solution, [forming an emulsion.]

The U. S. P. gum-resins are Ammoniacum, Asafœtida, Cambogia, Galbanum, Myrrha, and Scammonium.]

PHARMACEUTICAL PROCESSES.

Many of these, as filtration, precipitation, etc., need no explanation, but the following require a few words.

Dialysis —[The process of separating crystalloids from colloids by bringing them] in a mixed solution, into contact with one side of a membrane, such as a bladder, parchment or a parchment paper, which has water in contact with its other side, and resulting in the passage into the water of the crystalloid to form the "diffusate," the remainder constituting the "dialysate." In this way dialysed iron is prepared by diffusing the excess of the crystalloid acid solution.

[**Displacement.**—Another name for Percolation.]

Elutriation consists in diffusing an insoluble powder in water, letting the heavier part settle, then decanting the supernatant fluid. The heavier powder in this is allowed to settle, the fluid decanted, and so on until a fluid containing powder of the required fineness is obtained.

Levigation consists in reducing a drug to powder by triturating it with a little water and drying the resulting paste.

Lixiviation consists in the extraction with water of the sol-

uble matter of the ashes of anything which has been ignited, the solution being called a "lye."

Maceration.—[The extraction of the soluble portions of a substance which is not wholly soluble in the menstruum, by prolonged contact therewith.]

Percolation.—The extraction in a suitable vessel (the "percolator") of the so of a powder by the descent through it of a solve m"), the resulting solution being called the " lation enters into the manufacture of a great i ial preparations of organic drugs.

Scaling.—Scal made by drying concentrated solutions of es. The solid left behind forms a thin film on s film is broken up.

Standardizing. upper or lower limit, or both, of active constitu ug or its preparation must contain in order to be official, and prescribing an appropriate process for its determination. Satisfactory processes for standardizing are extremely difficult to establish, and have been adopted for the following only:

Cinchona, not less than 5 per cent. of total alkaloids.
Cinchona rubra, " " 5 " " "
Extractum nucis vomicæ, 15 " " "
Extractum nucis vomicæ fluidum, 1.5 per cent. of total alkaloids.
Tinctura nucis vomicæ, 0.3 per cent. of total alkaloids.
Opium, not less than 9 per cent. of crystallized morphine.
Opii pulvis, not less than 13 nor more than 15 per cent. of crystallized morphine.
Extractum opii, 18 per cent. of crystallized morphine.
Tinctura opii,
Tinctura opii deodorati, } 1.3 to 1.5 per cent. of crystallized morphine.]
Vinum opii.

WEIGHTS, MEASURES, AND SYMBOLS.

Weights [(Apothecaries' or Troy Weight).

1 grain . . . . . symbol, gr.
480 grains = one OUNCE . . . . . " ℥
12 ounces = one POUND . . . . . " ℔]

The scruple (20 grains, symbol ℈) is rarely used, and the drachm (60 grains, symbol ʒ) is commonly used.

Measures of Capacity.

1 minim	. . . . .	symbol,	♏
60 minims	= one FLUID DRACHM	"	ʒ
8 fluid drachms	= one FLUID OUNCE .	"	℥
[16 fluid ounces	= one PINT	"	O]
8 pints	= one GALLON . . .	"	C

Usually ʒ and ℥ are written fl ʒ and fl ℥ when they stand for fluid drachms and ounces.

Relations of Measures to Weights.

1 minim	is the measure of	[0.95 grains of	water.
1 fluid drachm	" "	56.96 "	"
1 fluid ounce	" "	455.69 "	"
1 pint	" "	7291.04] "	"

A 1 per cent, solution is approximately a grain in 100 minims.

A fluid grain is the volume of one grain of water at 60° F.; 15.5° C.; that is to say, it is a little over a minim [(1.05 ♏).]

In the pharmacopœial description of the various proportions which several parts of a compound bear to one another, the word parts means parts by weight; the term fluid parts signifies the volume of an equal number of parts of water.

Metrical System.—This, which is as follows, is official on the Continent:

WEIGHTS.

1 milligramme = 0.001 gramme.
1 centigramme = 0.01 "
1 decigramme = 0.1 "
1 gramme = weight of 1 cubic centimetre of distilled water at 4° C.; 39.2° F. Abbreviation, gm.
1 decagramme = 10.0 grammes.
1 hectogramme = 100.0 "
1 kilogramme = 1000.0 " Abbreviation, kilo.

MEASURES.

1 millilitre = 1 cubic centimetre (abbreviation, c.c.) = the measure of 1 [gm. of water.
1 centilitre = 10 c.c. = the measure of 10 gm. of water.
1 decilitre = 100 c.c. = " " 100 " "
1 litre = 1000 c.c. = " " 1000 " (1 kilo of water.)

Conversion of United States to Metrical System.

WEIGHTS.

1 grain = 0.0648 gm.
[1 ounce = 31.103 gm.
1 pound = 373.250] "

MEASURES.

1 minim	=	[0.0616 c.c.
1 fluid drachm	=	3.70 "
1 fluid ounce	=	29.57 "
1 pint	=	473.11 "
1 gallon	=	3785.51] "

Conv[illegible] United States.

1 [illegible]	15432 grains.
1 [illegible]	324 grains.
1 [illegible]	4 "
1	5.23 minims.
1	.81] fluid ounces.

In prescribing on [illegible] ls are weighed.

The weight used f[illegible] grammes, and this word is not expressed. Thus—

Magnesii sulphas	20.0	= 20 grammes of magnesium sulphate.
Hydrargyri chloridum mite	0.5	half a gramme of mild mercurous chloride.
Tinctura rhei	1.5	= a gramme and a half of tincture of rhubarb.

Domestic Measures.

A TEA-SPOONFUL is about a fluid drachm, [4 c.c.].

A DESSERT-SPOONFUL is about two fluid drachms, [8 c.c.].

A TABLE-SPOONFUL is about half a fluid ounce, [15 c.c.].

A WINE-GLASSFUL is about one and a half to two fluid ounces, [45 to 60 c.c.].

A TEA-CUPFUL is about five fluid ounces, [150 c.c.].

A BREAKFAST-CUPFUL is about eight fluid ounces, [240 c.c.].

A TUMBLERFUL is about eleven fluid ounces, [330 c.c.].

A DROP is often taken as being about a minim, but drops vary so much in size that they should never be used for children, nor as a measure of powerful drugs. For example, the number of drops in a fluid drachm of the United States Syrup of Acacia is 44, of Water 60, of Alcohol 146, of Chloroform 250.

PHARMACOPŒIAL PREPARATIONS AND THEIR DOSES.

Most drugs are not, in their natural state, suitable for administration. They are either too bulky, too nauseous, or contain noxious principles. Preparations suitable for administration are, therefore, prepared from them according to "official" pharmacopœial directions. The doses of the various drugs and their

preparations which may safely be given to an adult [are taken from the "Tables for Doctors and Druggists," 2d ed., compiled by Eli H. Long, M.D.;] but these doses are often not rigorously adhered to in prescribing. They vary with the purpose for which the drug is required and the age of the patient (*see* Doses, p. 38). The following is an account of the preparation of the pharmacopœial preparations, and the attempt has been made to arrange the doses so as to make them easy of remembrance.

[Unless otherwise specified, the preparations are for internal use.]

Aceta [(Vinegars).—Liquid preparations resulting from the extraction of the drug with diluted acetic acid, and filtering. The U. S. P. contains two.

	Dose.
Acetum Opii	3—20 ♏; .20—1.20. c.c.
Acetum Scillæ	10—45 ♏; .60—3.00. c.c.]

Aquæ [(Waters).—Preparations made by impregnating water with a volatile substance.

Mostly made by triturating the substance with precipitated calcium phosphate and filtering. Those in the U. S. P. thus made are—

	Dose.
Aqua Fœniculi, — Anisi	¼—1 fl ʒ; 8.—30. c.c.
— Cinnamomi	½—1 fl ʒ; 15.—30. c.c.
— Camphoræ, — Menthæ Piperitæ, — Menthæ Viridis	½—2 fl ʒ; 15.—60. c.c.

Three are made by distillation:

	Dose.
Aqua Aurantii Florum Fortior	indeterminate
— Destillata	indeterminate
— Aqua Rosæ Fortior	indeterminate

Six are simple solutions in cold water:

	Dose.
Aqua Hydrogenii Dioxidi	1—3 fl ʒ; 4.—12. c.c.
— Creosoti, — Chloroformi	1—4 fl ʒ; 4.—15. c.c.
— Amygdalæ Amaræ	2—4 fl ʒ; 8.—15. c.c.
— Rosæ	indefinite
— Aurantii Florum	"

Three are made by passing gases through water:

	Dose
Aqua Ammoniæ Fortior	3— 6♏; .20— .40. c.c.
— Ammoniæ	10 –20♏; .60—1.20. c.c.
— Chlori	1—4 fl ʒ; 4.— 15. c.c.

Cerata (Cerates).—Adhesive preparations for external use, containing wax, capable of being spread at ordinary temperatures, and not melting at the body. Six are official in U. S. P.

Ceratum dis | Ceratum Resinæ
— Camphoræ | — Plumbi Subacetatis

Charta (Paper t papers coated with plaster-like preparatio asters. The U. S. P. contains two:

Charta S ard.
— Potass potassium nitrate.

Collodia (Collo tions for external use made by impregnating collodion, a solution of pyroxylin in ether and alcohol, with an active substance.] When applied externally a protective film is formed owing to the rapid volatilization of the solvent. [The U. S. P. contains four:

Collodium. | Collodium Cantharidatum.
— Flexile. | — Stypticum.

Confectiones (Confections).—*Synonym.*—Electuaries. In England also called Boluses. Permanent pasty preparations of powdered drugs thoroughly triturated with syrup or honey. The U. S. P. contains two:

Confectio Rosæ, used as a basis for pills.
— Sennæ . . . dose, 1—2 ʒ; 4.—8. gm.

Decocta (Decoctions.)—Liquid preparations of organic drugs, 5 grammes of drug to 100 c.c. of decoction unless otherwise specified by the physician or Pharmacopœia, made by exhausting the drug by boiling in water, straining the resulting liquid, and adding sufficient cold water to secure the required ratio. The U. S. P. contains two:

	Dose.
Decoctum Cetrariæ	1—4 fl ʒ; 30.—120. c. c.
— Sarsaparillæ Compositum . .	

Elixira (Elixirs).—Sweet and aromatic liquid preparations, containing 20 to 25 per cent. of alcohol. There are two in the U. S. P.:

Elixir Aromaticum . . . . . dose, indeterminate.
Elixir Phosphori . . . . . dose, ½—2½ fl ʒ; 2.—10. c. c.

Emplastra (Plasters).—Tenacious preparations for external application, solid at ordinary temperatures, but pliable and adhesive at the temperature of the body. Those of the U. S. P. are:

Emplastrum Plumbi	Lead oxide, olive oil and water. Lead oleate and glycerin are formed.
— Ammoniaci cum Hydrargyro	Lead plaster as the basis.
— Ferri	
— Hydrargyri	
— Opii	
— Saponis	
— Resinæ	Lead plaster and wax as the basis.
— Arnicæ	Resin plaster, which is made from lead plaster, as the basis.
— Capsici	
— Belladonnæ	Resin and soap plaster as the basis.
— Picis Burgundicæ	Wax the basis.
— Ichthyocollæ	Court plaster.
— Picis Cantharidatum	Warming plaster.

Emulsa (Emulsions).—Liquid preparations consisting of oily or resinous substances held suspended in water which has been rendered mucilaginous or viscid. Mucilago Acaciæ and Tragacanthæ are frequently used to form emulsions. Mucilago Acaciæ should be recently prepared. It is incompatible with ferric chloride, borax, and lead subacetate.

Emulsions are coagulated by acids, an undue proportion of metallic salts, and spirituous liquids. There are in U. S. P.:

	Dose.
Emulsum Chloroformi	1—4 fl ʒ; 4.—16. c. c.
— Ammoniaci	½—1 fl ʒ; 15.—30. c. c.
— Asafœtidæ	
— Amygdalæ	as vehicle.

Extracta (Extracts).—Solid or soft-solid preparations not

agreeing in strength, made by evaporating solutions of the active constituents of organic drugs to the required consistency.

The drug is first powdered, then macerated and percolated with the appropriate menstruum to exhaustion. The first third of the percolate is reserved, the remainder is evaporated at a temperature not exceeding 122° F.; 50° C.; until its weight is ten per cent. of that of the drug used, then mixed with the reserved portion, and both are evaporated at or below the above-named temperature until an extract of [illegible] mains. For converting extracts into powdered extracts [illegible] y to add an inert dry substance. The menstrua used are

(*a*) Alcohol; Ext[illegible]bis Indicæ, Cimicifugæ, Colocynthidis Compositum, [illegible]sostigmatis.

(*b*) Alcohol and v[illegible]donnæ Foliarum Alcoholicum, Digitalis, Euonymi, Le[illegible]hei, and Uvæ Ursi.

(*c*) Alcohol, wate[illegible]; Extractum Cinchonæ, and Hyoscyami.

(*d*) Diluted Alcol[illegible]æ Radicis, Cinchonæ, Colocynthidis, Juglandis, and S[illegible]

(*e*) Water; Extractum Aloes, Gentianæ, Glycyrrhizæ, Hæmatoxyli, Krameriæ, Opii, and Quassiæ.

(*f*) Water and Aqua Ammoniæ; Extractum Glycyrrhizæ Purum.

(*g*) Acetic Acid and water; Extractum Colchici Radicis.

(*h*) Acetic Acid and diluted alcohol; Extractum Conii.

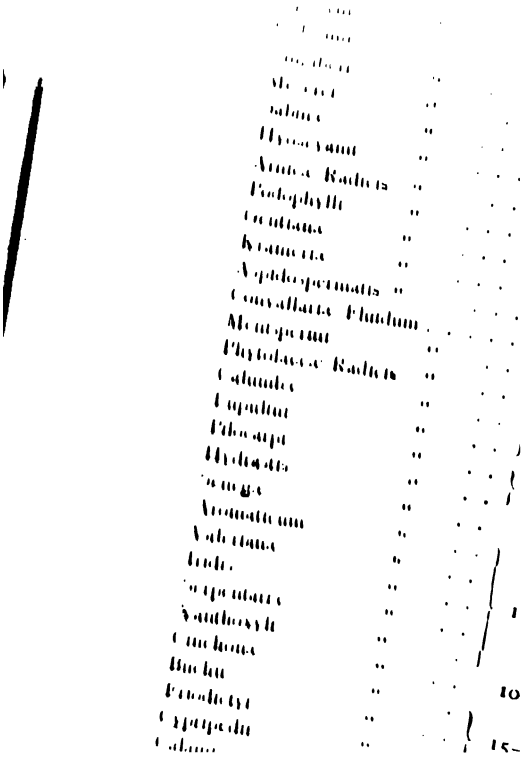
(*i*) Acetic Acid, alcohol, and water; Extractum Nucis Vomicæ.

(*k*) Inspissated Juice; Extractum Taraxaci.

(*l*) Evaporated Fluid Extract; Extractum Ergotæ.

They are in the U. S. P.

	Dose.
Extractum Aconiti	$\frac{1}{10}$—$\frac{1}{4}$ gr.; .006—.015 gm.
Physostigmatis	$\frac{1}{10}$—$\frac{1}{2}$ gr.; .006— .03 gm.
Belladonnæ Foliarum Alcoholicum	$\frac{1}{8}$—$\frac{1}{2}$ gr.; .008— .03 gm.
Nucis Vomicæ, Opii	$\frac{1}{8}$— 1 gr.; .008— .06 gm.
Cannabis Indicæ	$\frac{1}{6}$—$\frac{3}{4}$ gr.; .01—.045 gm.
Stramonii Seminis	$\frac{1}{4}$—$\frac{1}{2}$ gr.; .015— .03 gm.
Digitalis	$\frac{1}{4}$— 1 gr.; .015— .06 gm.
Conii	$\frac{1}{3}$— 1 gr.; .02— .06 gm.
Colocynthidis, Colchici Radicis, Hyoscyami	$\frac{1}{2}$— 2 gr.; .03— .12 gm.
Quassiæ, Aloes	$\frac{1}{2}$— 3 gr.; .03— .20 gm.



FLUID EXTRACTS.

		Dose.
Extractum Scoparii Fluidum	. . .	
— Rhei	" . .	
— Rhois Glabræ	" . .	
— Rosæ	" . .	
— Rumicis	" . .	
— Stillingiæ	" . .	
— Uvæ Ursi	" . .	
— Viburni Prunifolii	" . .	
— Leptandræ	" . .	
— Geranii	" . .	¼—1fl ʒ; 1.00—4.00 c.c.
— Ergotæ	" . .	
— Pareiræ	" . .	
— Pruni Virginianæ	" . .	
— Sarsaparillæ	" . .	
— " Compositum	" . .	
— Chiratæ	" . .	
— Cimicifugæ	" . .	
— Cubebæ	" . .	
— Lappæ	" . .	
— Spigeliæ	" . .	¼—2fl ʒ; 1.00—8.00 c.c.
— Rubi	" . .	
— Aurantii Amari	" . .	
— Hamamelidis	" . .	
— Castaneæ	" . .	
— Asclepiadis	" . .	½—2fl ʒ; 2.00—8.00 c.c.
— Chimaphilæ	" . .	
— Eucalypti	" . .	
— Frangulæ	" . .	
— Matico	" . .	
— Scutellariæ	" . .	
— Viburni Opuli	" . .	1—2fl ʒ; 4.00—8.00 c.c.
— Dulcamaræ	" . .	
— Sennæ	" . .	1—3fl ʒ; 4.00—12.00 c.c.
— Taraxaci	" . .	
— Cocæ	" . .	1—4fl ʒ; 4.00—15.00 c.c.
— Cusso	" . .	
— Tritici	" . .	1—8fl ʒ; 4.00—30.00 c.c.
— Glycyrrhizæ	" . .	Freely.]

Glycerita (Glycerites).—Solutions of drugs in glycerin.

They are all liquid preparations used for external application. [In the U. S. P. are six:

Glyceritum Acidi Carbolici.	Glyceritum Boroglycerini.
— Acidi Tannici.	— Hydrastis.
— Amyli.	— Vitelli.

Infusa (Infusions).—Liquid preparations of organic drugs, 5 grammes of drug t[illegible]n, unless otherwise specified by the physician or [illegible]ade by exhausting the drug for a specified time [illegible], by water poured upon it at a boiling temper[illegible]d adding sufficient water to secure the required [illegible]

The infusions o[illegible]:

Infusum Digita[illegible]	1—4fl ℥; 4.—15. c.c.
— Cinchonæ .	1—2fl ℥; 30.—60. c.c.
— Pruni Virgini	
— Sennæ Comp	1—2½fl ℥; 30.—75. c.c.

Two are made with **Cold Water**: Infusum Chinchonæ, and Pruni Virginianæ.

One is compound: Infusum Sennæ Compositum.

One contains acid: Infusum Cinchonæ.]

Infusions should be freshly made, as they readily decompose.

Linimenta [(Liniments).—Solutions or mixtures for external application, liquid, at least upon application. All of which are intended to be rubbed into the skin except Linimentum Calcis. Those in the U. S. P. are:

Linimentum Ammoniæ . . .	Ammonia water and cotton seed oil.
— Calcis	Solution of lime and linseed oil.
— Camphoræ	Camphor and cotton seed oil.
— Plumbi Subacetatis . . .	Solution of lead subacetate and cotton seed oil.
— Belladonnæ	Fluid extract of drug and camphor.
— Cantharidis	Cantharides and oil of turpentine.
— Chloroformi	Chloroform and soap liniment.
— Saponis	Soap, camphor, oil of rosemary, and alcohol.
— Saponis Mollis	Soft soap, oil of lavender flowers, alcohol, and water.
— Sinapis Compositum . . .	Oil of mustard, fluid extract of mezereum, camphor, castor oil, and alcohol.
— Terebinthinæ	Resin cerate and oil of turpentine.

Liquores (Liquors).—Solutions of chemical substances in a menstruum consisting chiefly or wholly of water. The following are the liquors of the U. S. P.:

	Dose.
Liquor Iodi Compositus — Sodii Arsenatis — Arseni et Hydrargyri Iodidi	1—10 ♏; .06—.60 c.c.
— Potassii Arsenitis — Ferri Acetatis — — Chloridi — — Nitratis — — Subsulphatis	2—10 ♏; .12—.60 c.c.
— Acidi Arsenosi	5—10 ♏; .30—.60 c.c.
— Ferri Citratis	5—15 ♏; .30—1.00 c.c.
— Sodæ	5—20 ♏; .30—1.20 c.c.
— Potassæ	5—30 ♏; .30—2.00 c.c.
— Sodæ Chloratæ	½— 1 fl ʒ; 2.— 4. c.c.
— Ferri et Ammonii Acetatis	1— 4 fl ʒ; 4.— 15. c.c.
— Calcis — Potassii Citratis	1— 8 fl ʒ; 4.— 30. c.c.
— Ammonii Acetatis	2— 8 fl ʒ; 8.— 30. c.c.
— Magnesii Citratis	2— 8 fl ʒ; 60.—240. c.c.

Used only externally:

Liquor Ferri Tersulphatis.	Liquor Plumbi Subacetatis Dilutus.
— Hydrargyri Nitratis.	— Sodii Silicatis.
— Plumbi Subacetatis.	— Zinci Chloridi.

Massæ (Masses).—Pill-masses intended for preservation in bulk until required for use. Three are official in the U. S. P.:

	Dose.
Massa Hydrargyri	½—15 gr.; .03—1.00 gm.
— Ferri Carbonatis	1— 5 gr.; .06— .30 gm.
— Copaibæ	¼— 1 ʒ; 1.00—4.00 gm.

Mellita (Honeys).—Mixtures of medicinal substances with clarified honey. The U. S. P. contains only two, one of these being simply honey purified.

Mel Despumatum. | Mel Rosæ.

Misturæ.—(Mixtures)—Liquid preparations of insoluble suspended active substances, or solutions containing more than

one liquid of therapeutical activity. The mixture is usually flavored, and is for internal administration. Examples in U. S. P.

	Dose.
Mistura Rhei et Sodæ	1–2 fl ʒ ; 1.— 8. c.c.
— Glycyrrhizæ Composita	1—4 fl ʒ ; 4.—15. c.c.
— Cretæ	2—4 fl ʒ ; 8.—15. c.c.
— Ferri Composita	

Mucilagines. hesive liquids or jelly-like preparations, consi arch dissolved in or fully charged with wate ntains four :

Mucilago Acaciæ. Mucilago Tragacanthæ.
— Sassafras Medu — Ulmi.]

There is no fixed ; 4. c.c.

Oleata.—Olea oleic acid, intended for external applicatio contains three :

Oleatum Hydrargy w mercuric oxide in oleic acid).
Oleatum Veratrinæ (2 per cent. of veratrine in oleic acid).
Oleatum Zinci (5 per cent. of zinc oxide in oleic acid)].

Olea.—There are many oils in the Pharmacopœia. They are all obtained by distillation or by expression except Oleum Phosphoratum, which is a solution of phosphorus in almond oil. [The U. S. P. olea are :

	Dose.
Oleum Sinapis Volatile	⅛—¼ ♏ ; .008—.015 c.c.
— Amygdalæ Amaræ	1/6—½ ♏ ; .01— .03 c.c.
— Tiglii	¼— 2 ♏ ; .015— .12 c.c.
— Aurantii Florum	
— Myristicæ	1— 3 ♏ ; .06— .20 c.c.
— Cajuputi	1— 5 ♏ ; .06— .30 c.c.
— Cari	
— Anisi	
— Caryophylli	
— Cinnamomi	
— Lavandulæ Florum	
— Menthæ Piperitæ	
— — Viridis	
— Pimentæ	
— Rosmarini	

	Dose.
Oleum Betulæ Volatile	1— 5♏; .06— .30 c.c.
— Sassafras	
— Thymi	
— Sabinæ	
— Phosphoratum	
— Fœniculi	
— Gaultheriæ	
— Hedeomæ	
— Coriandri	2— 5♏; .12— .30 c.c.
— Chenopodii	2—10♏; .12— .60 c.c.
— Santali	
— Juniperi	
— Copaibæ	5—15♏; .30—1.00 c.c.
— Erigerontis	
— Cubebæ	5—20♏; .30—1.20 c.c.
— Eucalypti	5—30♏; .30—2.00 c.c.
— Terebinthinæ	
— — Rectificatum	
— Morrhuæ	1—4 fl ʒ; 4.—15. c.c.
— Amygdalæ Expressum	
— Ricini	¼—2 fl ʒ; 8.—60. c.c.
— Lini	½—2 fl ʒ; 15.—60. c.c.
— Sesami	indefinite.
— Olivæ	freely.
— Gossypii Seminis	externally.
— Picis Liquidæ	
— Cadini	
— Theobromatis	
— Adipis	in pharmacy.
— Æthereum	
— Myrciæ	as perfume.
— Aurantii Corticis	as flavoring agent.]
— Bergamottæ	
— Limonis	
— Rosæ	

Pilulæ.—Solid bodies, usually spherical or oval, containing medicinal agents, and intended to be swallowed whole. A mass of the consistence of firm clay is made by beating medicaments together in a mortar. This mass is, with a machine, divided up

and rolled into pills. In order that they may not possess a disagreeable taste, they are varnished, gilded, or sugar-coated. Unless the constituents are very heavy, each pill should not exceed 5 grains [.30 gm.] in weight. Soap, bread crumb, and confection of rose are common excipients for pills. Glycerin is often added, for it attracts moisture and prevents the pill from getting hard. Pil[illegible]gar or gelatin-coated] are often kept in som[illegible]odium, to prevent their sticking together. [illegible]. S. P. are:

	Dose.
Pilulæ Phosphor[illegible]	gr.; .00065 gm. in each.
— Opii	[illegible]; .065 gm. in each.
— Asafœtidæ .	[illegible]; .20 gm. in each.
— Ferri Iodidi .	2 pills.
— Catharticæ Co[illegible]	
— Antimonii Com[illegible]	
— Aloes et Mastic[illegible]	3 pills.
— Rhei Compositæ	1—4 pills.
— Aloes	
— Aloes et Ferri	
— Rhei	1—5 pills.
— Catharticæ Vegetabiles . . .	
— Ferri Carbonatis	
— Aloes et Asafœtidæ	
— Aloes et Myrrhæ	2—10 pills.

Pulveres (Powders) —Preparations consisting of finely powdered drugs, or (compound powders), mixtures of the same, and frequently consisting in part of a suitable diluent or excipient.] The best diluent for powders is sugar of milk, because of its hardness and insolubility. [The powders of the U. S. P. are:

	Dose.
Pulvis Antimonialis	½— 2 gr.; .03— .12 gm.
— Ipecacuanhæ et Opii	3—15 gr.; .20—1.00 gm.
— Morphinæ Compositus . . .	5—15 gr.; .30—1.00 gm.
— Cretæ Compositus	5—60 gr.; .30—2.00 gm.
— Aromaticus	10—30 gr.; .60—2.00 gm.
— Jalapæ Compositus	¼—1 ʒ; 1.—4. gm.
— Rhei Compositus	½—1 ʒ; 2.—4. gm.
— Glycyrrhizæ Compositus . . .	½—2 ʒ; 2.—8. gm.

For Pulvis Effervescens Compositus, Seidlitz Powder, *see* Sodium. Pulvis Ipecacuanhæ et Opii is practically a trituration.

Spiritus (Spirits).—Solutions of volatile substances in alcohol or diluted alcohol. The spirits of the U. S. P. are:

	Dose.
Spiritus Glonoini	1— 5 ♏; .06— .30 c.c.
— Ætheris Compositus	5—60 ♏; .30—4.00 c.c.
— Phosphori	8—40 ♏; .50—2.50 c.c.
— Cinnamomi	10—30 ♏; 1.00—2.00 c.c.
— Amygdalæ Amaræ	15—45 ♏; 1.00—3.00 c.c.
— Ætheris	15—60 ♏; 1.00—4.00 c.c.
— Camphoræ — Chloroformi — Juniperi — Lavandulæ — Myristicæ	30—60 ♏; 2.00—4.00 c.c.
— Ammoniæ Aromaticus	½—2 fl ʒ; 2—8. c.c.
— Anisi — Gaultheriæ	1—2 fl ʒ; 4.—8. c.c.
— Juniperi Compositus	1—4 fl ʒ; 4.—15. c.c.
— Aurantii — — Compositus	as vehicle.
— Myrciæ	as perfume.
By solution with maceration:	
Spiritus Limonis	as flavoring agent.
— Menthæ Piperitæ — — Viridis	5—15 ♏; .30—1.00 c.c.
By gaseous solution:	
Spiritus Ammoniæ	10—60 ♏; .60—4.00 c.c.
By chemical reaction:	
Spiritus Ætheris Nitrosi	½— 2 fl ʒ; 2.—8. c.c.
By distillation:	
Spiritus Frumenti	indefinite.
— Vini Gallici	indefinite.

Suppositoriæ (Suppositories).—Preparations in suitable form] for introduction into [and retention] in the rectum or vagina [and so mixed with a base (usually Oleum Theobromatis) that they shall be solid under ordinary conditions, but shall melt or liquefy after introduction. One only is official in U. S. P.:

Suppositoria Glycerini; base, stearic acid.

...turæ (Tinctures).—Solutions alcohol of the soluble constituents of ... volatile. (Includes also, as an exceptio of iodine.)] They are prepared by—

(*a*) Maceration; *e. g.* [Tinctura Opii Campl

(*b*) Percolation; *e. g.* [Tinctura Lavandulæ

(*c*) Maceration and Percolation; *e. g.* [Tinct

(*d*) Simple mixing of ingredients; *e. g.* [Tinc

Tinctures containing only one active substance compound; *e. g.*, Tinctura Catechu Composita.

Some are compound, although it is not expres Tinctura Aloes. The tinctures of the U. S. P. are:

Tinctura Aconiti		½— 1
— Iodi		1— 5
— Cantharidis		1—15
— Veratri Viridis		2—10
— Strophanthi		
— Ipecacuanhæ et Opii		3—15
— Opii		3—20
— — Deodorati		
— Arnicæ Radici		5—10
— Nucis Vomicæ		5—20
— Opii Camphorata	child	3—20
	adult	1— 4
— Belladonnæ Foliarum		
— Scillæ		

	Dose.
Tinctura Physostigmatis	10—30 ♏; .60— 2.00 c.c.
— Colchici Seminis	
— Arnicæ Florum	15—45 ♏; 1.00— 3.00 c.c.
— Gelsemii	15—60 ♏; 1.00— 4.00 c.c.
— Moschi	
— Zingiberis	
— Aloes	
— Myrrhæ	
— Guaiaci	30—60 ♏; 2.00— 4.00 c.c.
— — Ammoniata	
— Lavandulæ Composita	
— Asafœtidæ	
— Benzoini	
— — Composita	
— Kino	¼—2 fl ʒ; 1.00— 8.00 c.c.
— Lactucarii	
— Chiratæ	½—2 fl ʒ; 2.00— 8.00 c.c.
— Cimicifugæ	
— Cinchonæ	
— Valerianæ	
— — Ammoniata	
— Quassiæ	
— Quillajæ	
— Hydrastis	
— Serpentariæ	
— Krameriæ	
— Catechu Composita	
— Cubebæ	½—3 fl ʒ; 2.00—12.00 c.c.
— Sanguinariæ	½—4 fl ʒ; 2.00—15.00 c.c.
— Tolutana	1—2 fl ʒ; 4.00— 8.00 c.c.
— Croci	
— Humuli	
— Cinnamomi	
— Aurantii Dulcis	
— Gallæ	
— Aurantii Amari	
— Cardamomi	
— Rhei Aromatica	1—3 fl ʒ; 4.00—12.00 c.c.
— Cinchonæ Composita	1—4 fl ʒ; 4.00—15.00 c.c.
— Rhei	
— Calendulæ	

	Dose.
Tinctura Aloes et Myrrhæ	1—2½ fl ʒ ; 4.00—10.00 c.c.
— Calumbæ.	1—4 fl ʒ ; 4.00—15.00 c.c.
— Hyoscyami	
— Sumbul	
— Gentianæ Composita	
— Bryoniæ	1—5 fl ʒ ; 4.00—20.00 c.c.
— Cardamomi	1—4 fl ʒ ; 8.00—15.00 c.c.
— Rhei Dulcis	1—1 fl ʒ ; 8.00—30.00 c.c.
— Matico	1—1 fl ʒ ; 15.00—30.00 c.c.
— Vanillæ	lavoring.
— Pyrethri	sternally.

Trituraciones lid preparations made by triturating a medi a definite percentage of sugar of milk (Sacc e U. S. P. contains one:

	Dose.
Trituratio Elate	to 1 gr.; .03—.06 gm.

Trochisci (Troches).— arations, usually in flattened form, consisting of one or more medicinal substances mixed with sugar or extract of liquorice and held in form by the addition of mucilage. Fifteen are official in U. S. P.

Examples; Trochisci Catechu, Trochisci Sodii Bicarbonatis.] The dose of each is from 1 to 6 troches in the course of the day.

Unguenta (Ointments).—[Unctuous preparations, either soft or solid at ordinary temperatures, but liquid upon being rubbed upon the skin. They are generally spread over the skin, or may be rubbed into it. They are only intended for external use.] The basis is either lard, olive oil, expressed oil of almond, lard oil, wax, suet, spermaceti, or paraffin. Benzoinated lard is often used to prevent decomposition. [Twenty-seven are official in U. S. P.]

Examples: Unguentum Hydrargyri, Unguentum Iodi.

Vina.—Wines are weak tinctures, [the drug being extracted with white wine, containing twenty to twenty-five per cent. by weight of absolute alcohol.]

With Vinum Antimonii and Vinum Ipecacuanhæ the dose depends upon the purpose for which the drug is used.

	Dose.
Vinum [Opii	3—20 ♏ ; .20— 1.20 c.c.
—Colchici Radicis	5—15 ♏ ; .30— 1.00 c.c.
— Antimonii (expectorant)	5—60 ♏ ; .30— 4.00 c.c.
— Ipecacuanhæ	1—60 ♏ ; .06— 4.00 c.c.
— Colchici Seminis	10—30 ♏ ; .60— 2.00 c.c.
— Ferri Citratis	1—2 ʒ ; 4.00— 8.00 c.c.
— Ergotæ — Ferri Amarum	1—4 ʒ ; 4.00—15.00 c.c.
— Album	as menstruum.
— Rubrum	"
— Aromaticum	as lotion.]

The following preparations [not occurring in the U. S. P.] are used:

Abstracta—[(Abstracts) solid, dry, powdered extracts of double the strength of the crude drug. They are prepared by spontaneous evaporation of an alcoholic tincture at a low temperature, mixing with it enough Sugar of Milk to make the product weigh one-half of the original weight of the drug, and then reducing it to a fine powder.]

Bougies.—Solid cylinders impregnated with various drugs, and used for introduction into the urethra or nose. They are made either of gelatin (to be dipped in warm water before use) or cacao butter (to be dipped in oil before use).

Cachets, made of wafer paper, consist of two watch-glass-shaped halves, enclosing the drug, which adhere when moistened. The cachet is swallowed, and thus nauseous drugs can be administered.

Capsules, [usually made of gelatin, are also used for enclosing medicines so that they shall not be tasted, and they are now made for containing both solid and liquid substances. They are either soft and elastic or hard. The "empty capsule" is of the hard form and is made in two parts, the body to be filled when required for use, and the cap to fit tightly over it when filled.]

Cataplasma [(Poultices).—Soft, pasty masses used as a medium for the external and local application of a moist heat, with or without the addition of active medicaments. Any bland substance which will retain its heat and moisture for a long time is applicable for this purpose, a little oil or glycerin being often added to prevent caking. The substances chiefly used are flaxseed, elm bark, bread and milk, bran, and oatmeal.]

To make a poultice properly, the bowl in which it is mixed, the water, the spatula for mixing and spreading, the flannel or cheese-cloth on which it is laid, must all be as hot as is possible. The meal should be added gradually to the boiling water, which is continually stirred. It should not be spread so thick as to make it inconveniently heavy.

Cigarettes.—The drug replaces the tobacco of an ordinary cigarette.

Clysters.—[Another name for Enemata].

Collunaria.—Fluids used as nasal douches. This term is rarely used in the United States.

Collyria.—Fluids used as eye washes.

[**Enemata** (Enemas).—Liquids intended for injection into the rectum and designed to act medicinally, to evacuate the bowel mechanically, or to serve as nutrients.] When their object is to empty the bowel, they are large in bulk; when it is wished that they should be retained, they are small in bulk, and after injection a towel may be pressed against the anus.

[**Essentiæ** (Essences).—Preparations of B. P. corresponding to Spirits, U. S. P., but of 20 per cent. strength.]

Fomenta.—Fomentations consist of flannels wrung out in hot water, to which drugs may or may not have been added.

Gargarismata (Gargles) are fluid preparations for gargling.

Guttæ.—[Medicines directed to be taken by "drops."]

Haustus (Draught).—A medicine directed to be taken at a single "draught."

Injectiones (Injections).—[These are of two kinds, Rectal (*see* Enemata), and Hypodermatic. The latter are highly concentrated solutions intended for use by means of a hypodermatic needle. (*See* p. 37.)]

[**Inhalations.**—A common name for Vapores.]

Insufflationes.—Powdered medicines or medicated powders designed for blowing into the nares, larynx or throat.

Lamellæ (B. P.).—Small, thin discs made with gelatin and glycerin, and used to drop into the eye. They each weigh $\frac{1}{50}$th of a grain [.0013 gm.]

Linctus.—[(Never used in the United States.) A sweet mixture of a thick, syrupy consistence.] It is to be swallowed slowly, being retained some time in the mouth.

Lotiones (Lotions).—Liquid, usually aqueous preparations for external use, commonly applied upon lint [or muslin.].

Mollinum.—An ointment having for its basis mollin, a superfatted soap.

Nebulæ [Sprays].—Solutions sprayed into the throat by means of an atomizer.

[**Oxymella.**—Mellita containing acetic acid.]

Paste.—A name often applied to an ointment.

Pastillus (Pastilles).—[A name often applied to troches, and in England limited to] those having glyco-gelatin as a basis.

Succi [(Juices).—Expressed vegetable juices preserved by the addition of a definite proportion of alcohol.]

Tabellæ.—[A name often applied to troches, and in England restricted to those having chocolate as basis, and of definite weight.]

Vapores.—[Liquid preparations intended for administration by inhalation in form of vapor.]

PHARMACOLOGY AND THERAPEUTICS.

Before describing the actions and uses of drugs we must consider the manner, quantity and form in which to give them.

MODES OF ADMINISTRATION OF DRUGS.

(*a*) **Into the blood-vessels** by injection. This method is rarely used in man, excepting for transfusion of physiological saline solution.

(*b*) **Into the subcutaneous tissues** by hypodermatic injection. The skin of the patient, where it is lax, should be raised between the thumb and forefinger of the operator's left hand; the skin of the external surface of the forearm is often selected. In his right hand he takes a perfectly clean syringe containing the quantity of fluid to be injected, and fitted with an aseptic, hollow, silver needle, which is thrust under the raised piece of skin, but not into the muscles, for about an inch, care being taken to avoid wounding a vein. The syringe is slowly emptied, then withdrawn, and the thumb pressed lightly upon the seat of injection for a few seconds. The advantage of this method is that the drug is surely and quickly absorbed. The fluid used must not contain solid particles, nor be irritating, or abscesses will result; it must be aseptic, and therefore, if it is not freshly prepared, it may contain a little carbolic acid—or, better still, boracic acid, for this is non-poisonous and non-irritating. The bulk injected should, if possible, be about five minims; .30 c.c. For injections that are not in constant use it is advisable to keep the drugs in the form of soluble tablets or lamellæ, and to dissolve one in a few minims of water as required.

(*c*) **Into serous cavities** by injection. This method is rarely used in man except when the object is to antiseptically wash out a serous cavity, as the pleura which has been opened, or to produce adhesive inflammation, as in the injection of irritants into the tunica vaginalis.

(*d*) **Into mucous cavities.**—Drugs are most frequently given by the **mouth**, to be absorbed from the mucous membrane of the stomach or intestines, but the rate of absorption is much slower than from the subcutaneous tissue, and will depend upon whether the drug is readily soluble in the gastro-intestinal secretions, and whether it is given on an empty stomach, in which case it will be quickly absorbed; or on a full one, when it will be slowly absorbed. [When it is intended that the drug shall act only in the intestine, pills, made purposely insoluble in the gastric fluids, are administered.] Some drugs, given by the mouth and absorbed from the stomach, probably never reach the general circulation, as they are excreted in the bile by the liver. The drug must be in a pleasant, palatable form, and generally so combined as not to irritate.

Drugs are sometimes given by the **rectum**—in a solid form as **supposi-**

tories, in a liquid form as **enemata** or clysters; but they are not dissolved nor absorbed here so quickly as in the stomach.

For local effects they may be given by the **urethra** or **vagina** (**injections, bougies, pessaries**), or by the **respiratory passages** (**vapors, cigarettes, sprays,** or **nebulæ** for **inhalations**; **insufflations** for blowing into the throat and larynx; **gargarismata, trochisci,** for a local effect on the mouth and pharynx; **nasal douches** for the nose). For sprays an atomizer is required. Sometimes volatile drugs, as chloroform, ammonia, amyl nitrite, are inhaled for their general effect.

(*e*) **By the skin.**—Some drugs may be absorbed from the skin if mixed with some fatty substance, [especially lanolin.] In this way mercury may be absorbed by being rubbed in; but drugs are chiefly applied to the skin as ointments, plasters, etc., for their local effect.

They are also applied to the **eye** and **ear** as drops and washes.

DOSES.

The study of doses is termed **Posology.** In determining the dose the following considerations have to be borne in mind:

1. **Age.**—The adult dose is that for a person between twenty and sixty years old. [For women the dose should be somewhat smaller than for men.]

For **children** under twelve, add twelve to the age, and divide the age by the number thus obtained. Thus for a child aged eight the dose will be $\frac{8}{8+12}=\frac{2}{5}$ of an adult dose. From twelve to sixteen years from $\frac{2}{3}$ to $\frac{1}{2}$ the adult dose is required, and from seventeen to twenty years from $\frac{4}{5}$ to $\frac{2}{3}$. There are exceptions to this rule for individual drugs; *e. g.*, children take iron, cod liver oil, arsenic, and chloral very well, but they can take only very small doses of opium.

Above sixty years of age the dose should slightly diminish as age increases.

2. **Weight.**—In pharmacological experiments the dose should always be expressed as a proportion of the weight of the animal. In man the weight is not often considered, for it depends so much upon bone and fat, which are not active tissues.

3. **Habit.**—A man who is constantly under the action of a drug becomes very insusceptible to it. Thus an opium eater requires enormous doses of opium to produce any effect. A person who habitually takes purgatives requires very strong ones to open the bowels.

4. **Idiosyncrasy.**—The susceptibility to drugs varies very much. Some persons are salivated by minute doses of mercury, others bear it very well, and here is hardly a drug to which some people are not exceptionally indifferent or susceptible.

5. Time of Administration.—Drugs all act to greatest advantage when given so that their effect will be produced at its natural time. Thus soporifics act best when given in the evening, slowly acting purgatives when given overnight, quickly acting ones when given before breakfast, ergot when given during labor. [Drugs which are readily decomposed by the contents of the stomach should be given when that viscus is empty, preferably a half hour before the meal time.]

6. Mode of Administration.—We have seen that drugs are rapidly absorbed from the subcutaneous tissues. Therefore a smaller dose is required for subcutaneous injection than when the same drug is given by the stomach, for there absorption is slow. It is slower still from the rectum, therefore the dose must be larger. Also certain drugs are excreted by the liver or destroyed in it when given by the stomach. Absorption takes place quickly from an empty, slowly from a full stomach.

7. Mental Emotion.—Sometimes if the patient's mind is particularly fixed on the action of the drug, a small dose is powerful. For example, often if the patient is convinced he will sleep, a very small dose of morphine is all that may be required.

8. Temperature.—As the action of the drug on the organism is often partly chemical, the temperature must, in cold-blooded animals and excised structures, as muscle, etc., help to determine its action; but the temperature of man varies within so few degrees that this is not an important factor in medicine.

9. Preparation of Drug.—A smaller dose of a soluble preparation, as a tincture, will be required than of a solid preparation, as a pill, which will have to be slowly dissolved before absorption, although in the latter case much depends upon the process of manufacture.

10. Rate of Excretion.—It is obvious that, other things being equal, for prompt action a smaller dose will be required of a drug that is rapidly excreted than of one which is slowly excreted. [It is also true that, in order to maintain a continuous effect from drugs which are rapidly excreted, the doses must be repeated at shorter intervals.]

11. Cumulative Action.—Sometimes it is found that if a person has been taking a drug regularly, but without the production of any toxicological symptoms, these will suddenly develop. This is said to be due to the cumulative action of the drug. It may be caused by the following circumstances:

(*a*) The drug may be absorbed more rapidly than it is excreted. This is the cause of the cumulative action of mercury and lead, both of which are excreted with difficulty by the kidney.

(*b*) There may be a sudden arrest in the excretion of the drug. It is probable that digitalis and strychnine, when the quantity of them in the tissues

reaches a certain amount, contract the renal vessels, and hence excretion is arrested.

(*c*) It is possible that, owing to an alteration in the intestinal contents, a drug which was previously very slowly dissolved becomes quickly dissolved, and hence rapidly absorbed.

12. Disease.—The physiological action of drugs, and consequently the dose, are profoundly modified by disease. For example, a patient with peritonitis will bear enormous doses of opium. Antipyretics, which do not affect normal temperature, p ile temperature.

The tendency of towards smaller and more frequently repeated dose

G.

The more com s consists of—

(1) The Basis, or ient (*curare*).

(2) The Adjuvan its action (*cito*).

(3) The Corrigen s its operation (*tuto*).

(4) The Constitu nt, which imparts an agreeable form (*jucunde*).

Thus the object of every prescription is to cure quickly, safely and pleasantly. For example [in Pilula Rhei Composita the rhubarb is the basis, the aloes and myrrh form the adjuvans, and the oil of peppermint is the corrigens to prevent the griping]. In Mistura Cretæ the cinnamon water is the vehicle. Many drugs do not require anything to assist their action or correct their operation. [The scientific physician usually prefers to administer the remedies separately, in order to more accurately observe their effect, and as well to discontinue, or change the dose of, any one which may be necessary.]

Incompatibility of ingredients should be particularly avoided in prescriptions. There are three kinds of incompatibility:

(*a*) *Chemical Incompatibility; e. g.*, glucosides should not be ordered with free acids, which decompose them; nor alkalies, alkaline salts, iodides, or bromides with alkaloids, for they precipitate them.

Examples of chemical incompatibility are the prescribing of (1) tannic acid or substances containing it with alkaloids or metallic salts, especially those of iron; (2) vinegars or syrups containing acetic acid prescribed with carbonates lead to the evolution of carbon dioxide; (3) strychnine sulphate is decomposed by potassium bromide, and strychnine is precipitated; (4) chloral and alkalies form chloroform; (5) quinine sulphate and potassium acetate together cause a voluminous precipitate of quinine acetate; (6) lime water with mercury salts (this incompatibility is intentional in Lotio Nigra and Lotio

Flava), precipitates mercuric oxides; it decomposes carbonates and bicarbonates of alkalies; it precipitates solutions of quinine and morphine salts; (7) corrosive mercuric chloride is incompatible with most substances.

The following table, drawn up by Potter [Materia Medica, Pharmacy and Therapeutics, 5th Ed., p. 447,] shows the most important instances of solutions which mutually precipitate each other. The letter P means "forms a precipitate with."

Solutions of	Alkaloidal solutions (generally).	Metallic solutions (generally).	Solutions of Lead or Silver Salts.	Solutions of Calcium Salts.	Solutions of Magnesium Salts.	Solutions of Albumin or Gelatin.
Alkalies	P	P	P	P	P	. .
Tannic acid	P	P	P	.	. .	P
Carbonic acid and Carbonates	P	P	P	P	P	. .
Sulphuric acid and Sulphates		. .	P	P	. .	. .
Phosphoric acid and Phosphates	P	P	P	P	P	. .
Boric acid and Borates	P	P	P	. .	. .	. .
Hydrochloric acid and Chlorides	. .	. .	P	. .	. .	. .
Hydrobromic acid and Bromides	. .	. .	P	. .	. .	. .
Hydriodic acid and Iodides	P	. .	P	. .	. .	. .
Sulphides	. .	P	P	. .	. .	. .
Arsenical Preparations	. .	P	P	. .	. .	. .
Albumin	. .	P	P	. .	. .	. .

With the following drugs it is **particularly difficult to avoid chemical incompatibility:**

Chlorine in solution.	Potassium Acetate.
Liquid preparations of Iron.	Potassium Bromide.
Lead salts.	Tannic Acid.
Zinc salts.	Gallic Acid.
Silver salts.	Acidum Hydrocyanicum Dilutum.
Corrosive Mercuric Chloride (especially).	Mineral Acids.
	Liquor Potassæ.
Iodine and the Iodides.	Quinine Sulphate.
Potassium Permanganate.	Tincture of Guaiacum.

Substances rich in oxygen, as chlorates, iodates, permanganates, picrates, nitrates and bichromates should **not** be mixed **with readily oxidizable substances,** such as charcoal, sulphur, iodine, carbolic acid, glycerin,

turpentine, and organic compounds generally, for explosive compounds are very liable to be formed.

Poisonous compounds may be formed by the admixture of substances in solution; *e. g.*, potassium chlorate and the syrup of ferrous iodide liberate iodine, diluted hydrocyanic acid and calomel form mercuric cyanide, potassium chlorate and potassium iodide form, at the temperature of the body, a poisonous compound, probably potassium iodate.

If, in a mixture, incompatibles are inevitable, they should both be diluted with the vehicle before they are added to each other. The careful prescriber will avoid combining any of the above incompatible substances.

(*b*) *Physical Incompatibility.*—This occurs when the mixture of the substances will not form a clear solution; *e. g.*, insoluble powders and oils will not mix with water, the addition of which, to all spirits and all resinous tinctures, causes a precipitate; if an acid and quinine mixture is flavored with liquorice, the acid precipitates glycyrrhizin; an alcoholic solution added to chloral causes all the chloral to rise to the top.

In such cases the aqueous solution may be **thickened** so that the precipitate is suspended in it **to form an emulsion**, but even then the mixture must be shaken before a dose is taken. **Mucilage of acacia**, freshly made, is the best emulsifying agent. The substances incompatible with it are mentioned on p. 21. It should be made perfectly fresh. The addition of a little almond oil improves its appearance.

1 pt. of most fixed oils	requires of acacia	¾ pt.,	water	1 pt.
1 pt. of balsam of Peru	"	2	"	1½
1 pt. of oil of turpentine	"	1	"	1

Tragacanth is often used to form an emulsion or a suspension, and sometimes yolk of egg or milk are employed. **Liquor Potassæ** much facilitates the admixture of fixed oils and water. Tincture of senega aids the emulsification of any oil, even in small quantities, ♏x; .60 c.c., being sufficient for an ounce; 30. c.c., of a fixed oil. [Extractum quillajæ, one grain; .06 gm., dissolved in one ounce; 30. c.c., of water, will make a tolerably permanent emulsion with one ounce; 30. c.c., of fixed oil, or one drachm; 4. c.c., of oleoresin.] Magnesium carbonate is employed to aid the diffusion of an oil in water through which air is to be inhaled. The suspension of oil of turpentine in mucilage of acacia is a very common non-official example of an emulsion.

(*c*) *Pharmacological Incompatibility; e. g.*, the combination of purgatives with astringents. Sometimes this is intentional, as in the occasional addition of atropine to a hypodermatic solution of morphine. After the description of each drug, those that are incompatible with it will be enumerated.

THE PRESCRIPTION.

The details of a prescription should be written in the following order:

The *first* part is the *Superscription*, which is the sign ℞, an abbreviation for Recipe, "Take."

The *second* part is the *Inscription*, consisting of the names of the drugs in the genitive case (the vehicle in the accusative if *ad* is used with it), and their doses in the accusative.

The *third* part is the *Subscription*, that is to say, the directions to the dispenser. This in England and some other countries is written in Latin.

The *fourth* part is the *Signature*, that is to say, the directions to the patient (from the Latin "*Signetur*," let it be labeled). This is written in English.

The *fifth* part consists of the physician's name or initials at the bottom on the right, the patient's name at the bottom on the left, and under it the date; thus:

Superscription.—℞.

Inscription.—Tincturæ Ferri Chloridi, fl ʒ iij; [12. c.c.], (*basis*).
Quininæ Hydrochloratis, gr. xxx; [2. gm.], (*adjuvans*).
Magnesii Sulphatis, ℥ ij; [60. gm.], (*corrigens*).
Glycerini, fl ʒ ij; [60. c.c.], (*corrigens*).
Infusum [Cinchonæ], ad fl ʒ viij; [240. c.c.], (*excipient*).

Subscription.—Fiat mistura.

Signature.—Take one table-spoonful three times daily, two hours after meals. A. B. C. (physician's initials).

William Smith, Esq. (patient's name).
16th June, 1892 (date).

Abbreviations.—Although abbreviations are objectionable, yet this prescription could be written thus:

℞. Tinct. Fer. Chlor., fl ʒ iij; [12. c.c.]
Quin. Hydrochlor., gr. xxx; [2. gm.]
Mag. Sulphat., ℥ ij; [60. gm.]
Glycer., fl ʒ ij; [60. c.c.]
Inf. [Cinch.] ad fl ʒ viij; [240. c.c.]
F. m.

S. Take one table-spoonful thrice daily, two hours after meals.
William Smith, Esq. A. B. C.
16th June, 1892.

S, *ss* and *fs* are abbreviations for *semi*, a half, and *āā* for *ana*, of each.

The medicine may be prescribed as a **pill** when it is required that the patient shall carry it about with him, when only a small dose is needed, when it is desirable that it shall act slowly, when it is required to act on the lower bowel, when it is insoluble or nauseous, or when it is difficult to prescribe in the liquid form. Kaolin is the best basis for substances decomposed by contact with organic matter, as potassium permanganate.

Oils, and volatile, deliquescent or bulky substances should not be prescribed as pills, as they require much solid excipient; nor should pills be used for substances required to act immediately.

Abbreviations should be employed as little as possible. Serious mistakes have happened because the abbreviations have been ambiguous. The following are especially to be avoided:

Acid. Hydroc.	(may be	Acidum Hydrochloricum or Acidum Hydrocyanicum).
Ext. Col.	("	" Extractum Colchici or Extractum Colocynthidis).
Hyd. Chlor.	("	" Calomel, Corrosive sublimate or Chloral hydrate).
Hyd.	("	" Hydrargyrum, Hydras, Hydriodas, Hydrochloras or Hydrocyanicus).
Sulph.	("	" Sulphur, Sulphide, Sulphate, or Sulphite).

Sometimes the signature is written in Latin, and it is often abbreviated. A list of such abbreviations is given in the appendix.

In Great Britain [and in the United States] it is always understood, unless otherwise stated, that the preparations are those of the Pharmacopœia.

Ad.—The prescriber should be careful in deciding whether or not to use this word before the vehicle. If it had been left out in the prescription just given, the bulk of the mixture would have been nearly 10½ fluid ounces; [315. c.c.], and the amount of the ingredients in each dose would have been less than was intended.

Dispensing the Prescription.—The dispenser should bear the following rules in mind:—(1) Read the prescription through first. (2) Next write the directions, so that they have time to dry. (3) Solution by heat should not be used if more of the salt is ordered than will dissolve in cold water. In such case it must be suspended. (4) With fluids, measure them in such an order that the measuring glass shall be finally rinsed out with the vehicle. (5) Use glass scale pans. (6) Clean and put away everything directly after use. (7) If in the slightest doubt ask the prescriber. (8) If finally the prescription contains any insoluble matter, label "Shake the bottle." (9) If the medicine is very poisonous, label it as such and use a distinctive bottle. (10) If for outward application only, [label it as such]. (11) In dispensing substances chemically incompatible, if there is any likelihood that the new body formed is dangerous, communicate with the prescriber before dispensing (*e. g.* Potassium

acid in the plasma, and forming urates, which are much more soluble than free uric acid. The **diuretic** effect of the alkali aids the excretion of the urates.

Therapeutics.—The chief use of alkalies is their administration in **gout**, in which disease the uric acid is greatly in excess in the plasma. As the treatment has to be continued for some time, a preparation pset digestion, such as potassium citrate, is or lithium citrate, for the lithium compound e most soluble. For the same purpose the n aline waters are frequently prescribed.

In **lead-poisoi** cked up in the tissues in a very sparingly soluble m iodide is given with the object of forming a lead in the plasma, and consequently capable of ex dneys.

Alkalies have been rheumatic fever, on the assumption that there is a deleterious agent in the plasma, and that its solubility is increased by increasing the alkalinity of the plasma; but this treatment has now been abandoned in favor of that by salicylates. For the same theoretical reason alkalies have been given in rheumatoid arthritis.

Purgatives, *diaphoretics* and *diuretics* necessarily alter the composition of the plasma, and are largely used when there is much œdema of any part, or effusion into serous cavities, in the hope that as fast as these remedies drain off fluid from the plasma it will be replaced by that which is effused pathologically. Also they are given in conditions, as uræmia, in which it is thought that there are poisons in the blood, in order that their excretion may be hastened.

The composition of the plasma can also be altered directly either by venesection or transfusion.

B. Drugs acting on the Red Corpuscles.—The most important are those which can increase the amount of hæmoglobin when that is deficient. Strictly speaking, all these have a pathological and not a physiological action, for we know of no drugs which will increase the amount of iron in perfectly healthy blood. These drugs are called **hæmatinics.**

They are—

(1) **Iron and its salts.**
(2) **Arsenous acid.**
(3) **Potassium permanganate.**
(4) **Copper salts.**
(5) **Hydrochloric acid** (doubtful).
(6) **Potassium salts** (doubtful).
(7) **Phosphorus** (doubtful).

They not only increase the quantity of hæmoglobin in each corpuscle, but all the number of red corpuscles. Their action is much aided by good food, fresh air, and attention to the general health, and especially to the digestive organs. The mode of action of these hæmatinics is very obscure, and will be discussed under each drug. Iron is by far the most important.

Indirect hæmatinics are drugs which benefit the patient by removing some obvious cause for his deficiency in hæmoglobin, or anæmia, as it is generally termed. Such are mercury, given for syphilis, quinine for ague, etc.

Alcohol and quinine diminish the oxygenating power of the blood, for they render oxyhæmoglobin a more stable compound than it usually is, but their action in this direction is slight. Citrates and tartrates of the alkaline metals are partially oxidized to carbonates at the expense of the oxygen of the red blood-corpuscles. Quinine and hydrocyanic acid diminish the ozonizing power of the blood.

The size of the red blood-corpuscles is said to be diminished by carbon [dioxide] and morphine, and to be increased by oxygen, hydrocyanic acid, and quinine; and their number is said to be increased by small doses of mercury, when administered for a considerable time.

A large amount of sodium chloride causes the red corpuscles to pass rapidly through the walls of the capillaries.

There are some drugs which are not employed therapeutically for their action on the blood, which are nevertheless very important physiologically and toxicologically, for they kill by **altering the composition of the hæmoglobin,** thus preventing its uniting with oxygen. Such are carbon dioxide, which turns out the oxygen from oxyhæmoglobin, hydrocyanic acid, which forms cyanohæmoglobin, and potassium chlorate. Acetanilid, antipyrin, phenacetin, and nitrites, especially amyl nitrite, convert the hæmoglobin into methæmoglobin; acetanilid, amyl nitrite, and potassium chlorate, like pyrogallic acid, destroy the red corpuscles.

Phosphorus, arsenic, hydrogen sulphide, turpentine, iodine, and sulphur also reduce oxyhæmoglobin. Phosphorus is especially destructive to the blood.

When freshly drawn blood is exposed to the air its oxidization is diminished by hydrocyanic acid, alcohol, chloroform, quinine, morphine, nicotine, strychnine, and brucine.

C. Drugs acting on the White Corpuscles.—Most if not all drugs whi… mœbæ are poisons to white corpuscles when a… trength, which, however, is rarely the case in… All **irritants** which set up inflammation caus… rpuscles to wander through the capillary walls… **nona alkaloids**, viz., quinine, quinidine, … chonidine, have the power of arresting this n… quinine is the most powerful. **Berberine**… **etanilid** are also powerful. If the quinine is… capillaries, it prevents the white corpuscles from … ; if it is applied to the outside of the vessels, it prevents the corpuscles from wandering away from the vessel through the wall of which they have passed.

Veratrine applied to white corpuscles outside the body kills them.

Myrrh and other aromatics are said to increase their production by increasing absorption from the intestine.

The following facts do not fall under any of the previous headings:—Poisonous doses of mercury increase the fluidity of the blood, impair its power of coagulation, and diminish the solids in it. Cod liver oil increases the solids of the blood. Potassium iodide is said to increase the power of coagulation; other substances doing this will be described under astringents.

Division III.—Drugs acting on the Cardiac Mechanism.

The heart is capable of spontaneously originating impulses which in health begin in the sinus venosus, and spread downwards over the auricle and the ventricle to the apex. It used to be considered that these movements were due to spontaneous impulses proceeding from the cardiac ganglia surrounding chiefly the entrance of the superior and inferior venæ cavæ, the entrance of the pulmonary veins, and the auriculo-ventricular groove; but we now know that there is no certain evidence that these ganglia

originate impulses, and most of the evidence goes to show that the contraction of the muscular fibres is due to spontaneous impulses arising in them. This contractile power of the muscular fibres can be inhibited by the vagus, the fibres of which proceed from the vagal nucleus in the medulla, and can be augmented by the augmentor or accelerator nerve-fibres, which proceed downwards in the cervical spinal cord to the upper dorsal nerves, from which they pass through the first thoracic ganglion to the sympathetic, and so to the cardiac plexus, and thence to the heart. We are ignorant of any function for the cardiac ganglia; we know that medullated nerve-fibres lose their medulla in them, and that more fibres proceed from them than enter them. Possibly they have a nutritive function. We have, therefore, only to consider the action of drugs on the muscular substance of the heart, on the vagal or inhibitory fibres, on the vagal centre, on the augmentor, accelerator, or sympathetic fibres, and on the accelerator centre. The centres are remarkably easily affected by afferent impulses, proceeding from the heart itself or from almost any part of the body. Our information concerning the action of drugs on the heart of man is necessarily rather inexact, for many experiments are difficult to perform upon the mammalian heart, consequently the cold-blooded animals have been largely used; and as some differences are observed among them—for example, between the frog and the tortoise—it is probable that the deductions drawn from experiments upon the hearts of warm-blooded animals are not wholly applicable to man. In the following account of drugs the action described is that of a moderate dose; the action of a large dose is generally the reverse of that of a moderate dose.

A. Drugs acting upon the Heart directly.—Our knowledge of these has been gained by studying the action of drugs upon excised hearts or pieces of the heart, and the action of drugs locally applied to the heart, either by gently applying a solution externally, or by means of a transfusion canula. It is difficult to decide whether a drug acts upon the muscular fibre itself, or upon the fine nerves between these fibres, so that no

infest the alimentary canal. Three met with :

(1) Tapeworm (*Tænia solium* and *Tæni* **Aspidium** (mostly used), **Oleum Terebinth atum**, and **Pepo.**]

(2) Round-worm (*Ascaris lumbricoides*). **Spigelia** and **Senna.**]

(3) Thread worm (*Oxyuris vermicularis* jections of **salt water, infusion of quassia, luted oil of turpentine.** It is doubtful whether tine) relieve the patient by killing the thread-w or merely, by removal of mucus, render this par that rectal injections are useless. Large soap being in the knee chest position, give the best r

Anthelmintics for the tape- or roun when the alimentary tract is empty. I give a dose of castor oil a few hours be as to ensure that the drug comes in con expel the dead parasite a purgative sho after the anthelmintic. [Castor oil sho ium has been administered.] Purgati are called **Vermifuges. Vermici** applied to drugs which kill intestinal en

Antiparasitics or parasiticides are parasites. The term is usually applie parasites infesting the skin

These drugs have the same action without the final arrest in systole. The rate of the pulse is not markedly altered.

Drugs the chief action of which is to decrease the force of the contraction, usually with stoppage in diastole:

(1) Diluted acids.
(2) Strong solutions of salts of the alkaline metals.
(3) " of barium salts.
(4) " of copper double salts.
(5) " of zinc double salts.
(6) Strong solutions of chloral.
(7) Muscarine.
(8) Pilocarpine.
(9) Saponin (large doses).
(10) Apomorphine.
(11) Emetine.
(12) Salicylic acid (large doses).

Drugs an important action of which is to increase the rate of the cardiac beat:

(1) Atropine.
(2) Hyoscyamine.
(3) Daturine.
(4) Duboisine.
(5) Cocaine.
(6) Saponin.

Drugs an important action of which is to slow the rate of the cardiac beat (see also first list given above):

(1) Muscarine.
(2) Pilocarpine.

Drugs which increase both the force and the number of the beats:

(1) Alcohol.
(2) Ether.
(3) Chloroform.
(4) [Cactus.]
(5) Anæsthetics.
(6) Arsenical salts.
(7) Quinine.
(8) Strychnine.

Drugs which decrease both the force and the number of the beats:

(1) Antimony salts.
(2) Aconite.
(3) Hydrocyanic acid.
(4) Ergot.
(5) Veratrum Viride.
(6) Cevadilla.

B. Drugs acting on the Vagus Centre.—If we observe that the giving of a drug to an animal alters the beat of the heart, but that this alteration can be done away with, either by cutting the vagi or stimulating the peripheral end of the nerve,—if one only of them be cut,—we may conclude that the drug acted on the vagus centre in the medulla.

Drugs which stimulate the vagus centre: that is to say, the pulse is slowed, but this slowing disappears on section of the vagi:

(1) **Chloroform.**
(2) **Chloral.**
(3) **Butyl-chloral hydrate.**
(4) **Aconite.**
(5) **Veratrum Viride.**
(6) **Nicotine.**
(7) **Digitalis.**
(8) **[Sparteine.]**
(9) **Strophanthus.**
(10) **Squill.**
(11) **Convallaria Majalis.**
(12) **Hydrocyanic acid.**
(13) **Staphisagria (Delphinine.)**
(14) **Atropine.** } Only very early in their action.
Hyoscyamine. }
Daturine. }
Increased blood-pressure.
Venous blood.

Drugs which depr... ...rge doses of the drugs mentioned in the last list, and di... ...he blood-pressure, such as amyl nitrite, nitroglycerin, a...

C. Drugs act... ...**lerating Centre.**—We do not know anything ... ...press this. Some probably stimulate it, for the ... ...renders the pulse still more rapid after the vagi have been cut.

They are—

(1) **Ammonia.**
(2) **Caffeine.**
(3) **Picrotoxin.**
(4) **[Cactus.]**
(5) **Delphinine.**
(6) Any drugs which make the blood venous.

Therapeutics.—The drugs most used for their action on the heart are digitalis, sparteine, squill, strophanthus, convallaria majalis, caffeine, alcohol, ether, chloroform, [cactus], strychnine, belladonna, aconite, antimony, and hydrocyanic acid. The therapeutic indication for each of these drugs will be found given under the individual drug.

Division IV.—Drugs acting on the Vessels.

These are usually studied either by directly observing alterations in the size of the vessels in some thin structure, such as the ear of a rabbit, the mesentery, tongue, lung, web, or mylo-hyoid muscle of a frog, or the wing of a bat; or the rate of the flow may be observed. This can be conveniently done by cutting some part, as the toe of a frog, and noticing the rate at which

the blood flows from the cut vessels with and without the administration of the drug to the animal. It is often necessary that an artificial circulation should be maintained; for if not, it might be difficult to prove that the alteration in the quantity of blood flowing from the cut surface was not due to influences acting on the cardiac mechanism. In order to determine if the changes are due to local or central effects, it is necessary to destroy the spinal cord, or to cut the nerves going to the part. When a drug is applied locally, as to the mesentery, and the vessels alter, if the nerves going to the part are not cut, it is difficult to say whether this alteration is direct or reflex.

Drugs are applied to the interior of vessels by injecting them into the circulation.

We know that each vessel is controlled by vaso-constrictor and vaso-dilator nerves, and that these proceed by different paths from the central nervous system, but we do not know by which set of nerves drugs act; probably some by the vaso-constrictor, and some by the vaso-dilator. We can only classify the drugs into those which dilate or contract the vessels by local action, and those which produce these effects through their action on the central nervous system. When a drug acts locally we cannot tell whether it acts on the muscle in the wall of the vessel, or on the nerve terminations.

It of course follows that drugs acting on the heart, or on a large area, will considerably modify the blood-pressure.

A. Drugs acting locally on vessels.

Drugs which, when locally applied to vessels, dilate them:

(1) **Liquor Ammoniæ.**
(2) **Silver nitrate** (strong).
(3) **Zinc chloride** (strong).
(4) **Copper nitrate.**
(5) **Copper sulphate** (strong).
(6) **Mercuric nitrate.**
(7) **Arsenous acid.**
(8) **Antimony chloride.**
(9) **Antimony and potassium tartrate.**
(10) **Iodine.**
(11) **Bromine.**
(12) **Chlorine.**
(13) **Mineral acids** (strong).
(14) **Alcohol.**
(15) **Ether.**
(16) **Chloroform.**
} If prevented from evaporating.
(17) **Carbolic acid.**
(18) **Creosote.**

(19) All volatile oils, as oil of turpentine, and many substances containing them, as mustard, horse radish, etc.
(20) Senega.
(21) Chrysarobinum.
(22) Ipecacuanha.
(23) Capsicum.
(24) Mezereon.
(25) Croton Oil.
(26) Camphor.
(27) Cantharides.
(28) Phosphorus.
(29) Warmth, however applied, but usually as a poultice.

Irritants.—All of ... ate the vessels, are often spoken of as vascular irritan...

Rubefacients ... when locally applied to the skin, cause it to ... e of the vascular dilatation induced. All the ... efacients.

Vesicants.—... gs are sufficiently powerful irritants to cause ir... is goes no further than the exudation of plasm..., and this plasma collects under the epidermis ... the drug causing the production of vesicles is said to be a vesicant; *e. g.*, cantharides.

Pustulants are such of the above drugs as are sufficiently powerful irritants to cause the inflammatory process to proceed to the passage of leucocytes through the walls of the capillaries. They collect in the vesicles, which consequently become pustules; *e. g.*, croton oil.

Escharotics or **caustics** are the most powerful of all the above drugs. Their local application destroys the vitality of the part to which they are immediately applied, and sets up vascular dilatation of the surrounding area; *e.g.*, strong nitric acid, zinc chloride, silver nitrate, and arsenous acid.

Counter-irritants.—It has been shown by experiments on animals that when the vessels of the skin are dilated by the application of an irritant, those of the subjacent viscera are often reflexly contracted. The same is probably true of man. An irritant is called a counter-irritant when it is applied to the skin with the object of altering the size of the vessels of the subjacent viscera. It is particularly to be remembered that the action is a reflex nervous one, and is in no way due to the withdrawal of blood into the dilated vessels of the skin.

Drugs which, when locally applied to vessels, contract them:

These may act in two ways, either by contracting the muscular coat of the vessels, or by coagulating the albuminous fluids around them, the coagulum by its contraction constricting the vessels.

Those which act on the muscular coat of the vessels:

(1) **Cold**, however produced; hence rapidly volatilizing substances as ether.
(2) [**Cocaine.**]
(3) **Lead salts.**
(4) Dilute solutions of **silver salts.**
(5) **Diluted sulphuric acid.**
(6) **Alum.**
(7) **Hamamelis.**
(8) **Ergot.**
(9) [**Hydrastis.**]
(10) **Acetanilid.**
(11) **Antipyrin.**

Ergot when in the circulation causes powerful contraction of the muscular coat of the arteries. It is not quite certain if this is due to the local action of the ergot circulating through the vessels, or to its action on the vaso-motor centre. Ergot applied to the outside of the vessels has no action on them. All the above, except the last two, are used in medicine to contract vessels. The following have been shown by experiments in the laboratory to cause contraction of small arteries through which they circulate:

Salts of copper, zinc, tin, platinum, barium, all cause powerful contraction.

Salts of lithium, calcium, strontium, magnesium, cadmium, nickel, cobalt, and iron cause slight contraction.

Acetanilid and antipyrin act on the muscular coat of small vessels as powerfully as ergot.

Those which coagulate the albuminous fluids around the vessels:

(1) **Tannic acid** and all substances containing it: *e. g.*, nutgall, krameria, kino, hæmatoxylon, hamamelis, cinnamon, eucalyptus gum, catechu, and probably bael fruit.
(2) **Lead salts.**
(3) **Silver** salts.
(4) **Zinc** salts.
(5) **Copper** salts.
(6) **Alum.**
(7) **Ferric** salts.
(8) **Bismuth** salts to a slight extent.

B. Drugs which act on the Vaso-motor Centres.

Drugs which, by their action on the vaso-motor centres, dilate the vessels:

(1) **Nitroglycerin.**
(2) **Amyl nitrite.**
(3) **Sodium nitrite.**
(4) **Spiritus Ætheris Nitrosi.**
(5) **Belladonna.**
(6) **Stramonium.**
(7) **Hyoscyamus.**
(8) **Alcohol.**
(9) **Ether.**
(10) **Chloroform.**

(11) **Chloral.**
(12) **Antimony and Potassium Tartrate.**
(13) **Aconite.**
(14) **Ipecacuanha.**
(15) **Lobelia.**
(16) **Tobacco.**
(17) **Veratrine.**
(18) **Hydrocyanic acid.**
(19) **Opium** (slightly)

Some of the substances, which in small doses contract the vessels by central action, in large dose… …italis and squill.

Drugs which, by th… …centres, cause contraction of vessels:

(1) **Digitalis.**
(2) **Strophanthus.**
(3) [**Sparteine.**]
(4) **Squill.**
(5) **Hamamelis.**

Strychnine.
Lead salts (slightly).
Ammonia (slightly).
Ergot (probably).

Also, for a very sho… …action, some substances whose main action is to dilate t… …tral action; viz., belladonna, stramonium, hyoscyamus… …oform, hydrocyanic acid and veratrine.

Astringents are drugs wn… …ish the size of the vessels, and thus decrease the amount of exudation from them.

Styptics, or **Hæmostatics**, are drugs which stop bleeding. They comprehend **all astringents**, especially cold, lead and copper salts, hamamelis, ergot [hydrastis], tannic acid, and, above all, ferric salts, for they coagulate the blood which is flowing from the vessel, and the clot prevents further bleeding. Matico leaves, because of the numerous hairs on their under surface, favor coagulation of blood when locally applied to a bleeding surface. Cobwebs act in the same way.

Therapeutics.—Drugs which locally dilate vessels are [frequently] applied to stimulate sores to heal, and to promote absorption of inflammatory products, as seen in the application of iodine over joints in certain forms of joint disease; and as counter-irritants in many forms of disease of deep-seated organs, as in the application of a blister in pleurisy. Drugs which by their central action cause dilatation of all the vessels of the body are used in certain forms of heart disease, as in the use of amyl nitrite in angina pectoris; and some suppose that the good they do is brought about by dilating the vessels, and so rendering the work

of the heart easier. Drugs causing general vascular dilatation are also employed to cause dilatation of the vessels of the skin with the object of thereby leading to an increase of perspiration and an increased radiation of heat. Alcohol, Spiritus Ætheris Nitrosi, and Ipecacuanha, amongst others, are used in this way.

The most important use of astringents is as styptics; they are also used to check excessive discharges of all sorts, as in diarrhœa, leucorrhœa, etc., and in relaxed conditions of vessels, such as are often seen in pharyngitis.

There is perhaps no better opportunity than this of mentioning emollients and demulcents.

Emollients are substances which soften and protect parts. The word is usually employed for substances applied to the skin.

Common emollients are substances soaked in warm water, as hot fomentations and poultices, fats of various sorts, as lard and lanolin (hydrous wool fat), non-irritating oils, as olive oil, spermaceti, petroleum, vaseline, etc.

Demulcents are substances which protect and soothe parts. They are generally applied to mucous membranes, especially when unduly dry, and thus they are often used for the mouth.

Instances of them are gelatin, isinglass, glycerin, gum, honey, flaxseed, starch, and white of egg.

Division V.—Drugs acting on the Skin.

All those described in the last section act on the cutaneous vessels, but in addition we have—

A. Diaphoretics, or drugs which increase the amount of perspiration. These may do so either by stimulating the sweat centres in the spinal cord, the nerves proceeding from the centres to the glands, the terminations of the nerves in the gland, or the glandular cells themselves; or dilatation of the cutaneous vessels may, by the increase in the amount of blood and the greater warmth, stimulate the glands and lead to an increase of sweat. It is difficult to tell whether drugs acting on the vessels do not also act on the other parts of the mechanism; and it is also difficult to decide whether a drug acts on the gland-cells or the termination of the nerves, so we will consider diaphoretics under

two headings, those which act centrally and those which act peripherally. These are differentiated by observing whether the drug acts after the spinal cord is destroyed, [or] on a part of the skin after the nerves going to it are cut.

(*a*) *Diaphoretics acting peripherally:* **Pilocarpine** greatly increases the amount of sweat, acting in all probability on the nerve terminations in the gland-cells, but certai... Local applications of warmth, and **alcohol** taken i... the same way in addition to their vascular action.

(*b*) *Diaphoretics*

(1) **Nicotine.**
(2) **Antimony salt**
(3) **Ammonium**
(4) **Ammonium**
(5) **Ipecacuanha.**
(6) **Opium.**
(7) **Camphor.**

(*c*) *Diaphoretics ... is doubtful:* Senega, cubeb, colchicum, salicin, lobelia, ... citrate and **acetate.** All these, except the last two, are very feeble.

When a diaphoretic acts very powerfully it is called a **Sudorific.**

B. Anhidrotics, or **Antihidrotics,** drugs which diminish the amount of perspiration. The part on which these act is determined in the same way as in the case of diaphoretics.

(*a*) *Anhidrotics acting peripherally:* **Atropine** is very powerful; it acts on the terminations of the nerves in the glands; and **hyoscyamus** and **stramonium** probably act in the same way. The local application of **cold** has a similar action.

(*b*) *Anhidrotics the mode of action of which is doubtful:*

(1) **Acids.**
(2) **Muscarine.**
(3) **Nux vomica.**
(4) **Quinine.**
(5) **Picrotoxin.**
(6) **Zinc salts.**
(7) **Salicylic acid.**

Therapeutics.—Diaphoretics are used for three purposes: either to increase the amount of sweat because that of the urine is failing, and for this purpose pilocarpine is largely used; or in the hope that poisons may be excreted by the sweat, hence the use of pilocarpine in uræmia; or as mild antipyretics, in order to increase the loss of heat by increased evaporation; for this purpose alcohol, ipecacuanha, ammonium acetate, and opium were

formerly much employed, but of late years much more efficient antipyretics have been discovered.

Anhidrotics are used either for general conditions, as phthisis, or for local conditions, as sweating of the feet; but they are not of great use in medicine.

We do not know of any drugs which will alter the composition of the sweat, except in so far as that certain drugs may be excreted in the sweat when taken internally; such are iodine, potassium iodide, succinic, tartaric, and benzoic acids, the last in the form of hippuric acid.

We have no knowledge of the effects of drugs on the sebaceous secretion.

Certain drugs, when taken internally in large doses, **produce a rash** on the skin, possibly because in the course of their excretion through the skin they irritate it. Such are—

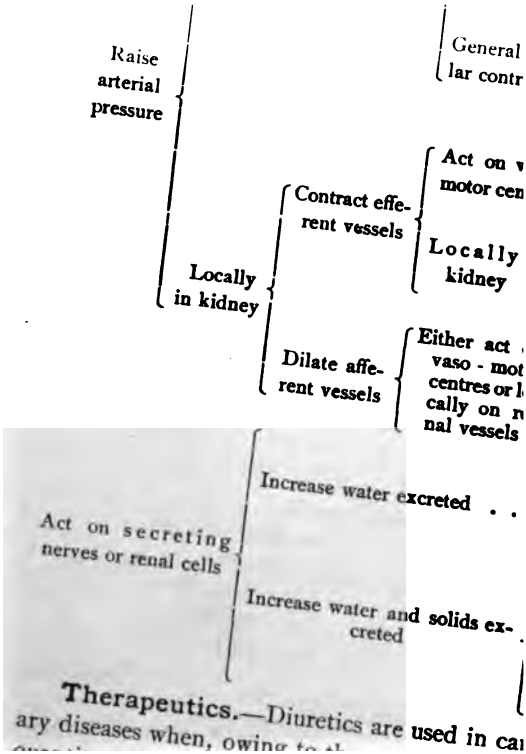
(1) **Copaiba.**
(2) **Cubeb.**
(3) **Bromides.**
(4) **Iodides.**
(5) **Turpentine.**
(6) **Belladonna.**
(7) **Chloral.**
(8) **Opium.**
(9) **Quinine.**
(10) **Salicylic acid.**
(11) **Arsenical salts.**
(12) **Acetanilid.**
(13) **Antipyrin.**
(14) **Phenacetin.**
(15) **Silver** salts may discolor the [skin.
(16) [Sulphonal.]

[The following quite rarely produce an eruption:

(1) **Iron.**
(2) **Strychnine.**
(3) **Creosote.**
(4) **Mercury.**
(5) **Veratrum.**
(6) **Digitalis.**
(7) **Sulphur.**
(8) **Antimony.**
(9) **Santonin.**
(10) **Cod Liver Oil.]**

Division VI.—Substances acting on the Urinary System.

1. *Drugs increasing the quantity of urine secreted.*—These are called diuretics. The kidney is a double organ with two distinct varieties of epithelium; it is particularly well supplied with vessels and vaso-motor nerves, and is also profoundly under the influence of variations in the blood-pressure; hence it is, with our present state of knowledge, impossible to say how many



Therapeutics.—Diuretics are used in ca
ary diseases when, owing to

always a question how far it is desirable to stimulate diseased organs. It is of great importance to remember that diuretics may act in many different ways; that there are many causes for diminution in the quantity of urine secreted, and that it is difficult to say in any particular case what is the cause of the decrease in the quantity secreted. Therefore, it is usual to give diuretics in combination, in the hope that if one of them does not have the desired result another will.

2. *Drugs diminishing the quantity of urine secreted.*—These are such as produce acute inflammation of the kidney when given in large doses; *e. g.*, turpentine, cantharides, phosphorus. They are never given for this purpose in medicine. Exalgin is reputed to diminish the quantity of urine.

3. *Drugs rendering the urine acid.*—There is only one drug that can do this effectually, and that is **benzoic acid**, for in its passage through the kidney it is converted into hippuric acid. Benzoic acid is, therefore, given when from any cause the urine undergoes alkaline decomposition anywhere within the urinary passages. Salicylic acid will, to a slight extent, increase the acidity of the urine, as will very large doses of citric acid, tartaric acid, the citrates and tartrates, [and possibly saccharin].

4. *Drugs which render the urine alkaline.*—All **salts** of the **metals, potassium, sodium, lithium, calcium,** will do this; even the tartrates, citrates, and acetates, for they escape by the kidney as carbonates. Nitric acid is said to increase the amount of ammonia in the urine, and thus to render it slightly alkaline. Ammonium salts given internally do not render the urine alkaline, because they are decomposed in the body, urea probably being formed.

Lithontriptics are drugs which prevent the decomposition, in the urinary passages, of the solids of the urine. If this fluid be acid, uric acid often crystallizes out, forming gravel or uric acid calculus; less often lime oxalate crystallizes, giving rise to lime oxalate calculus. When there is any likelihood of the formation of either of these calculi, alkalies should be given, especially the lithium salts. If the urine is undergoing alkaline decom-

position phosphates are liable to crystallize out. In this case the object will be to render the urine acid and aseptic. This will be attained by giving benzoic acid or benzoates, salicylic acid or the salicylates, and the urinary antiseptics.

Therapeutics.—The chief use of alkalies is to diminish the acidity of the urine, thereby preventing the precipitation of uric acid unlikely; or to retard the process when it is attempting to dissolve a uric acid calculus. Lithia water is a drug which will dissolve a lime oxalate calculus. Alkalies are given to gouty subjects, partly to alkalize the urine, partly to alkalize the urine, for such persons are liable to deposit uric acid in the urine. Potassium urate is more soluble than sodium urate, and lithium urate is even more so. Citrates and acetates are not likely to upset the stomach. Frequently the drugs most used are the potassium salts. Copious draughts of water, by diluting the urine, are useful in preventing the deposition of uric acid or lime oxalate calculi. Natural alkaline waters are largely used, especially those containing lithium.

5. *Drugs preventing the urine from decomposing.*—If the urine is retained in the bladder by stricture or from any other cause, it will undergo alkaline decomposition, and the same result may be brought about by the admixture of pus with the urine. This is generally due to inflammation of the pelvis of the kidney or the bladder. This decomposition of the urine may be prevented by giving drugs which in their excretion by the urine render it aseptic. Such are—

(1) **Benzoic acid.**
(2) **Salicylic acid.**
(3) **Uva Ursi.**
(4) **Copaiba.**
(5) **Cubeb.**
(6) **Oil of Sandal Wood.**
(7) **[Saccharin.]**
(8) **Many volatile oils.**

6. *Drugs altering the composition of the urine.*—Almost any drug will do this, either because it is excreted in the urine, or because it sets up some changes in the body, the products of which are excreted in the urine; but here we shall only refer to certain striking ones.

Turpentine, cantharides and salicylic acid in large doses will cause blood to appear in the urine, because they set up inflammation of the kidney.

Potassium chlorate, amyl nitrite, acetanilid, pyrogallic acid, poisoning by the mushroom, *Helvella esculenta*, and transfusion of animal's blood, break up red blood-corpuscles, and the products are excreted by the urine, rendering it dark. Large doses of mineral acids, arsenic, naphtol and naphtalin are said occasionally to produce the same result.

Phosphorus in large doses causes leucin and tyrosin to appear in the urine, and the urea is greatly increased.

The saline diuretics increase the solids of the urine.

The chrysophanic acid in rhubarb and senna makes the urine, if it is acid, a brownish color; if it is alkaline, a purplish red. Logwood renders alkaline urine reddish or violet. Santonin colors acid urine yellow or greenish-yellow, and alkaline urine, reddish. Carbolic acid, naphtalin, creosote and other preparations of tar, as well as the arbutin in uva ursi, chimaphila and gaultheria, make it dark greenish-brown. Picric acid makes it a bright-yellow, and methyl violet a dark-blue. The urine of persons poisoned with carbon dioxide remains sweet for months.

Poisoning by carbon dioxide, curare, amyl nitrite and turpentine, and sometimes mercury, morphine, chloral, prussic acid, sulphuric acid, alcohol, lead compounds, and salicylic acid lead to the appearance in the urine of a body which like sugar reduces Fehling's copper solution. Some authorities state that the urine, after the administration of these drugs, does not contain glucose, but glycuronic acid; for although it reduces blue copper solutions, it does not undergo alcoholic fermentation on the addition of yeast. The administration of phloridzin, or phlorizin (glucoside from the bark of stem and root of the apple, pear, plum and cherry, which when continuously heated with dilute mineral acids is resolved into glucose and phloretin), appears to lead to the production of genuine glucose in the urine.

Other drugs cause a peculiar odor in the urine; for example, the smell of violets is produced by turpentine. The aromatic odor of cubeb and copaiba can be detected in the urine after the administration of these bodies.

Lead, if taken for long periods, produces chronic interstitial inflammation of the kidney. It is stated that rarely mercury will do the same.

7. *Drugs acting on the bladder and urethra.*—The only ones of any practical value are **sedatives** to the urinary tract.

If the urine is decomposing, drugs preventing its decomposition come under this head. Other sedatives are **opium, belladonna, hyoscyamus, pareira, buchu** and **uva ursi**, which are direct sedatives to the vesical and urethral mucous membrane. If the urine is excessively acid, alkalies are urinary sedatives.

Urinary sedatives are used very largely in cases of cystitis and urethritis,

whatever the cause may be. Local astringent and antiseptic injections are also employed.

Division VII.—Drugs acting on the Bodily Heat.

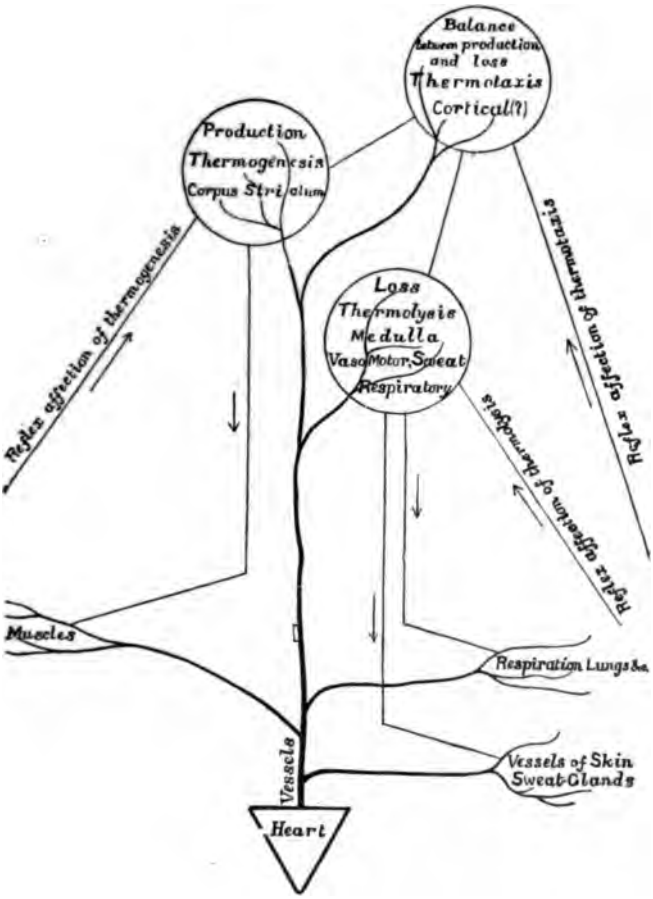
A. Antipyretics, or Drugs which decrease the Bodily Temperature.—There are few if any drugs which can lower the temperature i[illegible] is true, will cause the temperature to fall [illegible] to a healthy man in large enough doses to [illegible]e. The word antipyretic is limited to those [illegible]own the temperature when it is raised owing to [illegible] that the greatest amount of heat is produced [illegible] that there is a special part of the corpus str[illegible] this production; that heat is lost mostly by [illegible] vessels of the skin and by the evaporation [illegible] these vessels and the sudoriparous glands ar[illegible] of the central nervous system. Heat is also lost by excretion through the lungs, skin, bowels and bladder. It is highly probable that there is a part of the cerebrum whose function is to maintain the balance between the production and the loss. Also, all parts of this complex mechanism are supplied with blood-vessels, alterations in the calibre of which must affect the activity of the parts they supply.

There is every reason for believing that the part of the central nervous system which presides over the loss of heat (**thermolysis**), that which presides over the production of heat (**thermogenesis**), and that which presides over the balance between the production and the loss (**thermotaxis**), can, each of them, be influenced by afferent impulses reaching them from various parts of the body, and thus we see each of these three functions can probably be reflexly affected (see diagram on next page).

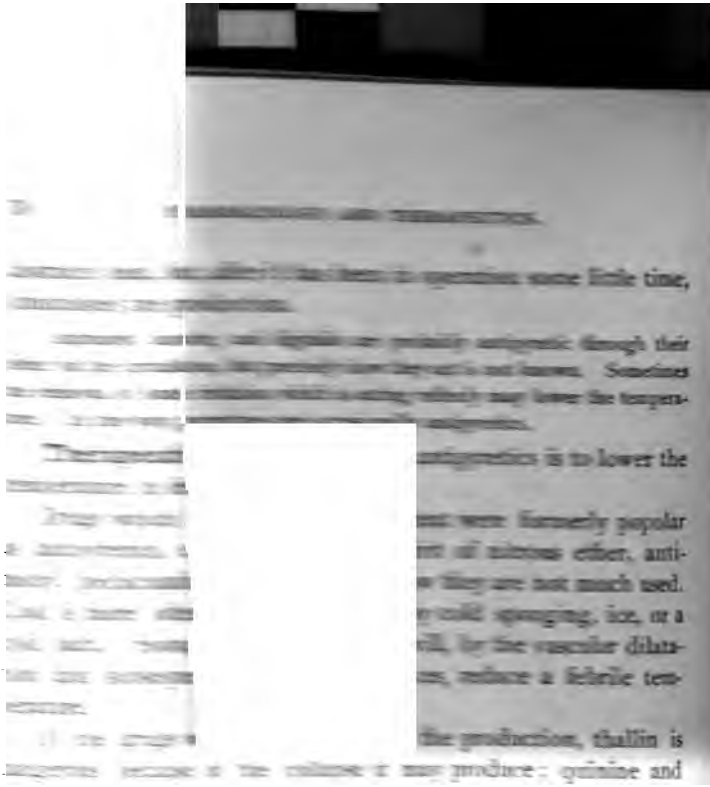
Antipyretics which increase the loss of heat.—All sudorifics and all dilators of the cutaneous vessels act as antipyretics. Cold, such as a cold bath, increases the loss of heat by direct abstraction.

Drugs which probably diminish the production of heat.—Our knowledge about these is at present uncertain, but it is very

probable that **phenacetin, antipyrin,** and **acetanilid** diminish the production by their action on the corpus striatum;



and that **quinine, salicylic acid, salicin,** and **thallin** also diminish the production; but we do not know upon what part of the thermogentic apparatus they act. A cold bath not only



Drugs which cause a rise of temperature.—Belladonna in poisonous doses may do this. How it acts is not known.

Various albumoses and certain animal poisons, such as that of shell fish, will cause a rise of temperature. Their mode of action is unknown.

We know of no drugs acting on thermotaxis.

Division VIII.—Drugs acting on Respiration.

Respiration can be modified by such very various influences that it is difficult to decide upon the exact mode of action of any drug which affects it. For example, alterations in the blood and in the air will modify it; the respiratory centre itself may be influenced, either directly or reflexly, from almost any organ in the body; or, again, the movements of the respiratory muscles themselves may be interfered with; and, lastly, respiration is much under the influence of the circulatory apparatus. Furthermore, the chief object in medicine is to remove the cause of the respiratory difficulty rather than to act upon respiration itself.

We have already spoken of those drugs which produce changes in the blood and the circulation, and the consideration of those modifications of the temperature, moisture, and pressure of the air which are of value in medicine, belongs to a book on general therapeutics. We will, therefore, now consider the respiratory drugs under the following heads:

A. Drugs altering the Composition of the Air inhaled.—It is found convenient to administer some drugs, although they are not given for their influence on respiration, by making the patient inhale them; such are anæsthetics and amyl nitrite.

Some drugs when inhaled are particularly irritating to the bronchial mucous membrane, causing dilatation of the vessels, increased secretion, and reflexly, cough from the stimulation of the sensory nerves of the bronchial mucous membrane.

Such are cold dry air, iodine, bromine, chlorine, sewage, ipecacuanha, sulphurous anhydride, nitric acid fumes, ammonia, and tobacco. These are rarely used therapeutically as inhalations, and their inhalation is to be particularly avoided in irritable conditions of the bronchi.

The drugs which, when inhaled, are **soothing** to the bronchial mucous membrane are—

Hydrocyanic acid. **Conium.**

Inhalations which are used to **stimulate** the [illegible] and

abstracts heat, but, after it has been in operation some little time, diminishes the production.

Antimony, aconite, and digitalis are probably antipyretic through their effect on the circulation, but precisely how they act is not known. Sometimes the removal of some irritation which is acting reflexly may lower the temperature. In this way, purgatives are occasionally antipyretics.

Therapeutics.—The sole use of antipyretics is to lower the temperature in fever.

Drugs which increase the loss of heat were formerly popular as antipyretics, especially alcohol, spirit of nitrous ether, antimony, ipecacuanha, and opium, but now they are not much used. Cold is more often employed, either by cold sponging, ice, or a cold bath. Sponging with hot water will, by the vascular dilatation and subsequent sweating it induces, reduce a febrile temperature.

Of the drugs which probably alter the production, thallin is dangerous because of the collapse it may produce; quinine and salicylic acid are rather uncertain, except in ague and rheumatic fever respectively. Acetanilid, antipyrin and phenacetin are most in demand. They are certain antipyretics, and they give rise to less fear of collapse than the others. Acetanilid is probably safer than antipyrin. Phenacetin is very safe, but it is not so powerful. They are quickly absorbed, and so they act promptly; they are far more powerful antipyretics than any drugs which act by increasing the loss of heat, and these are very uncertain in their action, often not lowering the temperature at all. Another reason for preferring drugs which diminish thermogenesis is that it is much more rational to lower the temperature by decreasing the production of heat than by increasing the loss, for then the production will, if anything, go on faster than before, in consequence of the attempt to compensate for the increased loss.

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Some drugs when inhaled are particularly irritating to the bronchial mucous membrane, causing dilatation of the vessels, increased secretion, and reflexly, cough from the stimulation of the sensory nerves of the bronchial mucous membrane.

Such are cold dry air, iodine, bromine, chlorine, senega, ipecacuanha, sulphurous anhydride, nitric acid fumes, ammonia, and tobacco. These are rarely used therapeutically as inhalations, and their inhalation is to be particularly avoided in irritable conditions of the bronchi.

The drugs which, when inhaled, are **soothing** to the bronchial mucous membrane are—

Hydrocyanic acid. | **Conium.**

Inhalations which are used to **stimulate** the bronchi, that

is to say, to increase their vascularity, secretion, and muscular power, are—

(1) **Carbolic acid** } ♏xx.; [1.20 c.c.]
(2) **Oil of cajeput** }
(3) **Oleum pini sylvestris**, ♏xxx.; [2.00 c.c.]
(4) **Tinctura benzoini composita**, } fl ℥ss; [15. c.c.]
(5) **Creosote**, }
(6) **Oil of cubeb**, }

The amounts given a[illegible] antities that should be added to a pint of water at 140° F.;

Inhalations whic[illegible] **isinfect foul secretions** from the bronchial n[illegible] are those of—

(1) **Creosote.**
(2) **Iodoform.**
(3) **Mild solutions**
(4) **Carbolic acid.**
(5) **Sulphurous anhydride.**
(6) **Oil of juniper.**
(7) **Oil of cubeb.**
(8) [**Oil of eucalyptus.**]

Inhalations for **re**[illegible] of the bronchial tubes are those of—

(1) **Conium.**
(2) **Stramonium.**
(3) **Chloroform.**
(4) **Ether.**
(5) **Amyl nitrite.**

B. Drugs acting on the Respiratory Centre.—If the drug, when injected into the carotid artery, very quickly produces its effect on respiration, it is concluded that it acts on the respiratory centre. Another experiment, often used to determine whether the drug acts on the centre, or on the vagal terminations in the lung, is to cut the vagi and to observe whether it acts similarly before and after the section.

Drugs which directly **stimulate** the respiratory centre are—

(1) **Strychnine.**
(2) **Ammonia** (very powerful).
(3) **Apomorphine.**
(4) **Belladonna.**
(5) **Stramonium.**
(6) **Hyoscyamus.**

Drugs which **depress** the respiratory centre are—

(1) **Physostigmine** (very powerful).
(2) **Chloral.**
(3) **Chloroform.**
(4) **Ether.**
(5) **Alcohol.**
(6) **Opium.**
(7) **Hydrocyanic acid.**
(8) **Aconite.**
(9) **Veratrine.**
(10) **Conium.**
(11) **Caffeine.**
(12) **Quinine.**
(13) **Ipecacuanha.**
(14) **Antimony salts** (both the last very weak).

Alcohol, ether, chloroform, caffeine, and quinine slightly excite before they depress.

Therapeutics.—The drugs which excite the respiratory centre may be used when there is any difficulty in respiration, especially with the view of increasing the force of the respiratory act whilst other means are employed to get rid of the cause of the difficulty. They are, of course, most frequently required in diseases of the lungs, especially bronchitis. Ammonia and apomorphine are often employed, as they are also powerful expectorants; and belladonna is useful when there is too much secretion from the bronchial tubes.

Substances which depress the respiratory centre are very little needed for this action; but the centre for the reflex act of coughing is in the close neighborhood of the respiratory centre, and **opium, hydrocyanic acid, conium,** and **ipecacuanha** are often very valuable in allaying the continual hacking cough which so frequently accompanies disease of the heart and lungs.

The drugs which relieve cough are very numerous, for it may be reflexly set up by irritation of so many peripheral parts, viz., nose, throat, pharynx, ear, teeth, larynx, trachea, bronchi, lungs, pleura, stomach, and liver; and consequently its removal may depend upon the removal of peripheral irritation in any of those organs.

C. Drugs affecting the Bronchial Secretion.

(*a*) *Those increasing it:*

(1) [Apomorphine.]
(2) **All alkalies,** especially ammonium carbonate and other salts.
(3) [Cocillana.]
(4) **Ipecacuanha.**
(5) **Senega.**
(6) **Squill.**
(7) **Turpentine.**
(8) **Camphor.**
(9) **Benzoin.**
(10) **Balsam of Peru.**
(11) " " **Tolu.**
(12) **Antimony salts.**
(13) **Sulphur.**
(14) **Iodine.**
(15) **Tobacco.**
(16) **Pilocarpus.**
(17) **Many volatile oils.**

(*b*) *Those decreasing it:*

(1) **Acids.**
(2) **Belladonna.**
(3) **Stramonium.**
(4) **Hyoscyamus.**

(*c*) *Those disinfecting it*:—Drugs which, when inhaled, act in this way have already been mentioned. Copaiba, cubeb, and many volatile oils are excreted partly by the bronchial mucous membrane, and thus will disinfect the secretion.

Therapeutics.—In bronchitis, remedies which increase the secretion are used when it is so viscid that it sticks to the tubes and cannot be coughed up; and those which decrease it are employed when it is too watery to be easily expectorated. The use of the disinfectants is obvious.

D. Drugs relaxing Spasm of the Muscular Coat of the Bronchial Tubes, or Antispasmodics.—It is believed that [the symptom], asthma is due to a spasmodic contraction of the bronchial tubes, and as—

(1) **Stramonium.**
(2) **Belladonna.**
(3) **Hyoscyamus.**
(4) **Grindelia.**
(5) **[Aspidosperma.]**

relieve this symptom, it is concluded that these drugs relax spasm of the muscular coat of the bronchial tubes. Stramonium is the most powerful. It is very likely, judging by their analogous action in other parts of the body, that the following drugs act in the same way:

Chloroform, ether, opium, chloral, cannabis indica, amyl nitrite, and conium.

Therapeutics.—Stramonium is of great use in asthma, and this and the other drugs may be employed for cases of bronchitis in which it is probable that the irritation caused by the inflammation of the tubes sets up spasm of them. Many of these muscular depressants in all probability depress the nerves at the same time.

E. Drugs acting on the Vessels of the Bronchi.—These are the same as have been already described as acting on the vascular system generally.

F. Expectorants.—The modes of action of drugs acting on the respiratory system are so complex that it is usual to regard most of them clinically, simply as drugs which hinder or aid the expectoration of the contents of the bronchial tubes. Those

which aid it are divided into two groups, named after their action, not on the lungs, but on the circulation.

1. *Stimulating expectorants.*—These are stimulants to the circulation generally. They are—

(1) **Acids.**
(2) **Ammonium salts.**
(3) **[Cocillana.]**
(4) **Senega.**
(5) **Squill.**
(6) **Benzoin.**
(7) **Benzoic acid.**
(8) **Balsam of Tolu.**
(9) " " **Peru.**
(10) **Turpentine preparations.**
(11) **Terebene.**
(12) **Oleum Pini Sylvestris.**
(13) **Nux Vomica.**
(14) **Sulphur.**

2. *Depressing expectorants.*—These depress the general circulation. They are—

(1) **Alkalies.**
(2) **Antimony salts.**
(3) **Ipecacuanha.**
(4) **Lobelia.**
(5) **Pilocarpus**
(6) **Apomorphine.**
(7) **Potassium Iodide.**

Therapeutics.—It is almost impossible to lay down any general directions. The prescriber must consider in any case before him whether he wishes to stimulate or to depress the circulation, to increase or to diminish or to disinfect the expectoration, to stimulate the respiratory centre, to overcome spasm of the bronchial tubes, or to allay a hacking cough; and he must combine his remedies according to the answer he makes to these questions. Warmth to the chest and warm drinks are sedative, and increase the amount of secretion. Cold and cold drinks have an opposite effect.

Division IX.—Drugs Acting on the Digestive Apparatus.

A. Drugs acting on the Teeth.—Soaps and powders are used for cleaning the teeth. The basis of most tooth powders is chalk, which acts mechanically; charcoal is sometimes used in the same way. As the food is very liable to collect and decompose between the teeth, antiseptics, as quinine, borax, and carbolic acid, are often mixed with tooth powders. Astringents, such as krameria, are employed if the gums are too vascular. Mineral acids and alum are injurious to the teeth if used for a

long time, and iron is liable to stain them; therefore these substances are best taken through a glass tube, and should not be used as gargles for long periods.

Toothache may be relieved by local anodynes, as opium, creosote, or pure carbolic acid. The tooth is plugged with absorbent cotton soaked in one of these. A piece of clean cotton must be placed over the carbolized cotton to prevent the carbolic acid from reaching the mouth.

B. Drugs acting on the Salivary Gland.—Much attention has been devoted to the submaxillary gland of the dog, and there is no reason for supposing that the other salivary glands of that animal or of other creatures differ markedly from it. We know that the submaxillary gland is under the influence of the chorda tympani nerve, which contains vaso-dilator fibres, and also some which directly modify the secretion of the gland apart from the secondary effects, due to the alterations in the vessels, obtained when the chorda tympani is stimulated. This nerve has its centre in the medulla, and is capable of being excited reflexly by stimulation of many nerves, even the sciatic, but especially by stimulation of the gastric branches of the vagus, and by the terminations in the tongue and mouth of the glosso-pharyngeal and gustatory nerves. The gland is also supplied with sympathetic branches which proceed from the cervical sympathetic trunk; these are vaso-constrictor, and can also modify the quality of the secretion; but we do not know so much about them as we do about the chorda tympani. Drugs which increase the amount of saliva have been called sialogogues; those which decrease it, anti-sialogogues. It is clear that there are very many ways in which each of these might act, but here it will suffice to enumerate only those ways in which they are known to act.

1. *Sialogogues acting either on the secretory cells or upon the terminations of the nerves in them.*—Of these pilocarpus has been most studied, and by means of the experiments it has been proved to act either on the cells themselves or the terminations of the nerves in them. It acts equally well after section of all the nerves going to the gland. It acts when it is injected directly

into the gland, but is prevented from reaching the general circulation. If it has been given, stimulation of the chorda or of the sympathetic produces no more effect on the amount of secretion than can be easily explained by the vascular effects.

Sialogogues falling under this heading are—

(1) **Pilocarpus.**
(2) **Muscarine.**
(3) **Compounds of Iodine.**
(4) **Mercury.**
(5) **Tobacco.**
(6) **Physostigmine.**

The last two probably act also by stimulating the centre in the medulla, for section of the chorda tympani decidedly lessens the secretion caused by them. Physostigmine soon ceases to cause an increase of the secretion, for it tightly contracts the vessels of the gland.

2. *Sialogogues acting reflexly by stimulating the peripheral ends of afferent nerves.*—Of these there are two important varieties:

(*a*) Those stimulating the gustatory and glosso-pharyngeal nerves in the mouth:

(1) **All Acids** and
(2) **Acid Salts.**
(3) **Chloroform.**
(4) **Alcohol.**
(5) **Ether.**
(6) **All** pungent substances, as mustard, ginger, etc.

(*b*) Those stimulating the vagus in the stomach:
Most emetics, especially **Antimony** and **Ipecacuanha.**

3. *Anti-sialogogues acting either on the secreting cells or the terminations of the nerves in them* —Of these atropine has been most studied, and it is proved to act directly on the gland by the fact that the administration of it prevents any increase of salivary secretion on stimulation of the chorda, although the vessels dilate as usual. It is highly probable that it acts upon the nerve terminations, because even after considerable doses, quite paralyzing the secretion of chorda tympani saliva, stimulation of the sympathetic will still induce secretion.

Anti-sialogogues falling under this heading are—

(1) **Belladonna.**
(2) **Hyoscyamus.**
(3) **Stramonium,** and
(4) **Nicotine** in excess.

4. *Anti-sialogogues acting reflexly by depressing the peripheral ends of afferent nerves.*—Alkalies, opium, and any substances

which allay irritation of the mouth. Part of the effect of opium is due to its depressing action on the medullary centre.

Therapeutics.—A deficiency in the amount of saliva secreted is seen most markedly in fever, when the mouth becomes very dry, and the patient complains of thirst. Sometimes it is a disease in itself, and the origin of this malady is then probably nervous. It is a prominent symptom of belladonna poisoning. In fever, acid drinks, especially those containing carbon dioxide gas, lemonade, etc., are of use as sialogogues. Drinks which relieve this febrile thirst are called **Refrigerants.** For [the condition known as] "dry mouth" pilocarpus has been used, and it will relieve the dryness due to belladonna poisoning. Excessive salivary secretion is hardly met with except as a symptom of poisoning, especially by mercury or pilocarpus. In some forms of indigestion the saliva has a very unpleasant taste, and may even be diminished in quantity, but then the indication is to treat the indigestion.

C. Drugs acting on the Stomach.—Strictly speaking, we ought to consider these under the following heads: (*a*). Those drugs which, either by modifying the secretion of pepsin, or in some other way directly influence the conversion of proteids into peptone, parapeptone and albumose. (*b*). Those which influence the property of curdling milk possessed by the gastric juice. (*c*). Those which modify the secretion of acid. (*d*). Those which modify the secretion of mucus. (*e*). Those which influence the nerves of the stomach. (*f*). Those which act on the vessels. (*g*). Lastly, those which are emetics. Our knowledge, however, is not sufficient to enable us to do this, and the most useful classification is into those affecting the secretion of gastric juice as a whole, the secreted contents, the vessels, the nerves, the movements, and emetics.

1. *Drugs increasing the amount of gastric juice secreted.*—These are usually called **stomachics,** and include a great many substances. Stimulants to the mouth reflexly increase the secretion of gastric juice; all bitter and aromatic substances act in this way, and they also increase the appetite. The mere presence

of food in the stomach stimulates the gastric flow. Probably aromatics and bitters act also on the stomach itself.

The drugs which increase the flow of gastric juice are—

(1) **Aromatics.**
(2) **Bitters.**
(3) **All alkalies** (especially potassium and sodium bicarbonates, and Spiritus Ammoniæ Aromaticus).
(4) **Alcohol.**
(5) **Ether.**
(6) **Chloroform.**
(7) **Magnesia.**
(8) **Magnesium carbonate.**
(9) **Pungent substances** (pepper, mustard, horseradish).

Therapeutics.—Stomachics are very largely used for the purpose of increasing the secretion of gastric juice in cases of dyspepsia.

2. *Drugs decreasing the amount of gastric juice secreted.*

(1) **Mineral acids.**
(2) **Acetic acid.**
(3) Many of those in the last list if given in large doses, *e.g.*, alcohol, ether and chloroform.

Therapeutics.—These drugs are never employed for this effect. It is particularly to be observed that while alkalies increase the secretion of the gastric juice, which is acid, they diminish that of the saliva, which is alkaline; but acids increase the secretion of the alkaline saliva, but diminish that of the acid gastric juice.

3. *Drugs altering the composition of the gastric contents.*—Acids and alkalies naturally modify the reaction of the gastric contents. For this purpose diluted mineral acids are often prescribed to be taken about two hours after a meal, in cases in which the cause of indigestion is thought to be that the amount of hydrochloric acid secreted is deficient. If the acid were given at meal-time it would prevent the secretion of the natural acid; but by giving it after the meal, when all the acid that the gastric juice is capable of forming has been secreted, the drug carries on the act of digestion. In case of indigestion in which, from the nature of vomited matters or from any other reason, it is considered that there is an excess of acid in the stomach, alkalies are given at meal-times, the favorite drug being sodium bicarbonate.

Pepsin is given, usually in combination with diluted hydrochloric acid, when it is probable that the cause of the indigestion is the secretion of too small an amount of pepsin; but in this, as in every other variety of dyspepsia, it is far more important to remove the cause of indigestion than to endeavor to modify the composition of the secreted gastric juice.

Many attempts have been made to try by the administration of **antiseptics** to prevent fermentation and putrefaction from going on in the stomach, but with only fair success, for a sufficient dose of any antiseptic is likely to be poisonous to the patient, and too large doses of antiseptics may hinder normal digestion.

Here even more than in the last case the right treatment is to remove the cause of the putrefaction.

Drugs that have been used for this purpose are—

(1) **Carbolic acid.**
(2) **Iodoform.**
(3) **Boric acid.**
(4) **Creosote.**
(5) **Eucalyptus.**
(6) **Thymol.**
(7) **[Resorcin.]**
(8) **[Salicin.**
(9) **Bismuth salicylate.]**
(10) **Sodium hyposulphite.**
(11) **Sodium sulpho-carbolate.**
(12) **Sulphurous anhydride.**
(13) **Naphtol.**

Charcoal has been employed, but when it is moist it is useless.

4. *Drugs which dilate the vessels of the stomach.*—The vessels of the stomach are very sensitive to irritation. They easily dilate upon mechanical irritation, and the presence of food, especially peptones, causes the vascularity of the mucous membrane to increase. Within limits greater vascularity is an advantage, for it not only favors the secretion of gastric juice, but it facilitates absorption.

The substances which increase the vascularity of the stomach are all stomachics (except alkalies), diluted mineral acids, the drugs which have already been enumerated as irritants generally, and squill, digitalis, colchicum, senega, copaiba, gamboge, guaiacum, and veratrine. This is a very long list, and many of the substances in it are never employed for their irritant effect; in fact, the only ones in common use are the stomachics; the others

are far too powerful, even small doses of them set up inflammation of the gastric wall, which is also produced by over-indulgence in stomachics, as we constantly see in the gastritis induced by alcohol. The therapeutics indications for this class of drugs are the same as those for stomachics generally.

Gastro-intestinal irritants.—In describing the individual actions of drugs the statement is frequently made that they are gastro-intestinal irritants, and that is a convenient opportunity for describing the symptoms produced in health by these drugs. If the drug has a caustic action, as many gastro-intestinal irritants have, the swallowing of it will cause considerable pain in the mouth and pharynx; in a short time these parts will become severely inflamed, and consequently very much reddened, swollen and painful. The tongue will be often much enlarged. If the drug is corrosive, sloughs, generally white in color at first, with a severely inflamed area around them, will be seen; as they fall off they will leave ulcers. Owing to the pain and swelling, it will for some time be impossible to take any food, or at the best only that of a soft or fluid nature. Directly [after] the drug reaches the stomach, intense irritation is set up; consequently the patient feels severe abdominal pain, and there is violent retching and vomiting. As the poison passes on, it produces its severe irritant effects on the intestine, and diarrhœa sets in. Both the vomited matters and the motions often contain blood. The general symptoms are an anxious countenance, small feeble pulse, scanty urine, a low temperature, and all the symptoms of collapse. Later on, the gastro-intestinal irritation may be severe enough to set up general peritonitis, or a gastric ulcer may form, and then there may be added to the case all the symptoms of gastric ulcer and its sequelæ. The inflammation of the œsophagus may lead to its contraction. At the post-mortem examination, if the patient has died soon after the administration of the poison, the stomach will be very red and ecchymosed, with a swollen mucous membrane. Parts of the intestine will be in the same condition. This severe inflammation may, in many places, have led to the formation of sloughs. It must be remembered that many gastro-intestinal irritants have no action on the mouth.

5. *Drugs which contract the gastric vessels.*—These are the same as those which have already been enumerated as being generally astringent. They are much more used for the intestine than the stomach, and will therefore be considered in detail presently (*See* p. 90).

6. *Drugs acting on the nerves of the stomach.*—All drugs powerfully irritant to the stomach cause pain in it; those that are only slightly irritant give rise to a sensation of warmth. It is never desired to produce gastric pain.

Gastric sedatives.—These drugs are the same as those which are local sedatives to other parts of the body. Those most used for the stomach are—

(1) **Bismuth subcarbonate.**
(2) **Bismuth subnitrate.**
(3) **Opium.**
(4) **Hydrocyanic acid.**
(5) **Carbon dioxide.**
(6) **Ice.**
(7) **Belladonna.**
(8) **Hyoscyamus.**
(9) **Stramonium.**

They are employed in the very many painful forms of dyspepsia. All, except perhaps stramonium, are in frequent use.

7. *Drugs acting on the movements of the stomach* —It has been observed that the movements of the stomach increase as the acidity of the contents increases. If it be that the acidity is the cause of the movements, anything which causes an increase of acidity will lead to more powerful movements. Apart from this, strychnine appears directly to stimulate the unstriped muscle of the gastric wall. Stomachics also probably aid the movements, so that our complete list will be mineral acids, nux vomica, and the stomachics.

The proper churning up of the gastric contents is so necessary, that the value in dyspepsia, of drugs which aid the gastric movements, is very great. Hence the frequency with which nux vomica enters into acid anti-dyspeptic mixtures.

Carminatives.—This term is often applied to substances which aid the expulsion of gas from the stomach and intestines. They act by stimulating the gastric and intestinal movements. It has

been found from clinical observation that the most efficient carminatives are—

(1) **Stomachics** generally, especially—
(2) **Aromatics.**
(3) **Bitters.**
(4) **Pungent substances.**
(5) **Asafœtida.**
(6) **Ammoniacum.**
(7) **Valerian,** and
(8) **Camphor.**

8. *Emetics.*—It is well known that the many complicated mechanisms involved in the act of vomiting are under the control of a centre in the medulla, which is capable of being stimulated by afferent impulses reaching it from many sources, such as the cerebrum, as when sights or smells cause sickness, the mouth, the pharynx, the œsophagus, the lungs, the heart, the stomach, the intestines, the biliary passages, the kidney, the peritoneum, and the uterus; so that the drugs acting on any of these organs, or on the centre itself, might be emetics. But it is usual, in describing drugs which cause vomiting, to mention only those which do so either by acting on the stomach or on the centre in the medulla, and they are divided into two corresponding classes. Those acting on the stomach are sometimes called **direct** emetics, because they act directly on the stomach; and those influencing the medulla are called **indirect;** but some authors reserve the word direct for those acting on the medulla, and speak of those affecting the stomach as indirect. Considering this confusion, it is better to divide emetics into gastric and central. By means of the following experiments we determine to which group any drug belongs:

(1) The emetic is injected directly into the circulation. If very shortly after this vomiting takes place, the drug must have acted on the medulla, to which it has been carried by the circulation; but if some time elapses we conclude it acted on the stomach, and that it was first excreted into this organ before vomiting took place. This experiment may be made still more striking by injecting directly into the carotid, for then the medulla is quickly reached.

(2) If the least quantity of the drug which, when injected

into the circulation, will produce vomiting is larger than is necessary when it is introduced directly into the stomach, the inference is that the drug acts primarily on the stomach, and that when it produces vomiting after injection into the circulation it only does so because some of it has been excreted into the stomach.

(3) If the drug will not produce vomiting after injection into the circulation when replaced by a bladder, it shows that it acted d mach; but if vomiting is produced it shows th on the medulla, and that the vomiting is cat action of the abdominal muscles.

(4) If the drug t: o act after its introduction into the stomach, it j rally; and the reason for the delay is that suf elapse for the drug to be absorbed.

In spite of these difficult to be sure about the action of emetics, for some act in both ways, and some may in the course of their circulation through the blood act upon some of the many parts of the body from which the vomiting centre receives afferent impulses.

The following is a list of those emetics which are commonly used.

Emetics acting on the stomach:

(1) **Alum.**
(2) **Ammonium carbonate.**
(3) **Copper sulphate.**
(4) **Zinc sulphate.**
(5) **Sodium chloride.**
(6) **Mustard.**
(7) **Warm water.**

Of these zinc sulphate and copper sulphate act slightly on the medulla.

Emetics acting on the medullary centre:

(1) **Apomorphine.**
(2) **Tartar emetic.**
(3) **Ipecacuanha.**
(4) **Senega.**
(5) **Squill.**

Of these tartar emetic and ipecacuanha act partly on the stomach. The first three are very powerful emetics, and are much more depressant in their action than the gastric emetics.

Therapeutics.— Emetics have two uses. Firstly, to remove the contents of the stomach. Thus when that organ is over-full,

and there is a feeling of nausea, an emetic by emptying the stomach may relieve. Emetics are largely used to empty the stomach in cases of poisoning, and they may benefit certain cases of sick headache. An emetic occasionally aids the expulsion of a foreign body which has become impacted in the fauces or œsophagus. Secondly, emetics are used to expel the contents of the air-passages, especially in children, for they cannot expectorate well. For this purpose these drugs are given to help children to expel the morbid products in bronchitis, laryngitis, and diphtheria. They also aid the expulsion of foreign bodies that have become impacted in the larynx. In choosing an emetic it will be remembered that although apomorphine, ipecacuanha, and tartar emetic are the most powerful they are the most depressant, and are therefore not suitable in many cases—such, for instance, as poisoning accompanied by severe collapse. When the poison is a powerful gastro-intestinal irritant, if the condition of the mouth and œsophagus will allow of it, it is preferable to wash out the stomach rather than to use an emetic.

Emetics are not permissible for patients suffering from aneurism, hernia, prolapse of uterus or rectum, peritonitis, or a tendency to hæmorrhage, because of the straining induced by the vomiting, which should make us cautious in giving them to those who have disease of their vessels or high tension in them, for the straining may lead to hæmorrhage.

9. *Anti-emetics.*—The causes of vomiting are so numerous that the number of drugs which may stop vomiting is very large; therefore, as in the case of emetics, we can only consider those which act either on the stomach or on the centre in the medulla.

Anti-emetics acting on the stomach.—These are all those substances which have been already enumerated as having a sedative influence on the gastric nerves, viz.:

(1) **Ice**, (2) **Bismuth subcarbonate**, (3) **Bismuth subnitrate**, (4) **Opium**, (5) **Hydrocyanic acid**, (6) **Carbon dioxide**. Also some drugs which occasionally appear to have a specific local action in arresting vomiting; such are (7) **Cocaine**, (8) **Cerium oxalate**, (9) **[Menthol]**, (10) minute doses of **Vinum Ipecacuanhæ**, (11) of **Tincture of iodine**, (12) and of

Arsenous acid, (13) small doses of each, of **Alcohol,** (14) **Carbolic acid,** (15) **Chloroform,** (16) **Creosote,** (17) **Ether,** (18) **Silver nitrate,** and (19) the **Sulphocarbolates.**

Anti-emetics acting centrally—

(1) **Opium,** (2) **Ammonium,** (3) **Potassium,** and (4) **Sodium bromides.** (5) **Chloral.** (6) **Amyl nitrite.** (7) **Nitroglycerin.** (8) **Diluted hydrocyanic acid.** (9) **Alcohol.** It will be noticed that some drugs fall under both headings.

Therapeutics.—The very name of these drugs indicates their therapeutical application. At the best they are only palliative; the right way to treat vomiting is, if possible, to remove the cause. Of anti-emetics, ice, diluted hydrocyanic acid, carbon dioxide, bismuth salts, morphine, [menthol] and iodine are perhaps the most reliable, but all are very uncertain.

D. Drugs acting on the intestines.—Many secretions are poured into the intestine, the food is much altered by the time it arrives there, and it is changed in its course down the intestine; the physiology of intestinal digestion, of the movements and the nervous mechanisms of the intestine are imperfectly known; drugs may be considerably altered by the time they come to this part of the alimentary canal, and its diseases are little understood; consequently we cannot arrange the action of drugs in a physiological classification. We know, in fact, of only [three] divisions, purgatives, [antiseptics] and astringents.

The methods of experiments which have been used to determine the mode of action of purgatives are chiefly those of Thiry and Moreau. The first-named observer cut the intestine across in two places a short distance apart: the isolated part which was still attached to the mesentery was sewn up at one end; the other, the open end, was attached to the abdominal wall, and thus there was a test-tube-like piece of intestine into which drugs could be placed, The parts of intestine, on either side of the excised piece, were sewn together, so that the whole intestine was the same as before, but a little shorter. This method did not give very satisfactory results, and consequently Moreau devised his experiments, which seem more trustworthy. He put four liga-

tures round the intestine at equal distances apart, so that he shut off from the rest of the intestine and from each other three pieces of intestine, each of the same length. With a fine syringe he injected into the middle piece the drug to be experimented upon, and returned the whole into the abdominal cavity. In a few hours the animal was killed, and the state of the interior of the middle piece was contrasted with that of the pieces either side of it. Before Moreau's experiments there had been much discussion as to whether some purgatives did not act only by increasing the action of the muscular coat, and others only by stimulating the secretions, but from these experiments it appears that probably the majority act in both ways, some very slightly on the secretion and powerfully on the muscle, and others slightly on the muscle and powerfully on the secretion. We will first consider intestinal purgatives, [then intestinal antiseptics] and [finally] intestinal astringents.

Purgatives are divided into the following classes.

Laxatives.—These are substances which slightly increase the action of the bowels chiefly by stimulating their muscular coat.

They are—

(1) Whole meal bread.	(11) Sulphur.	
(2) Honey.	(12) Magnesia.	
(3) Treacle.	(12) Olive oil.	
(4) Most fruits, especially—	(14) Castor oil (small doses).	
(5) Tamarind.	(15) Ergot.	Not used except under medical orders.
(6) Fig.	(16) Physostigma.	
(7) Prune, and	(17) Nux Vomica.	
(8) Stewed apples.	(18) Belladonna.	
(9) Manna.	(19) Hyoscyamus, and	
(10) Cassia [Fistula].	(20) Stramonium.	

These are all of them domestic remedies employed for slight cases of constipation, especially in children; some, as brown bread, fruits, honey, form articles of diet with persons who are liable to constipation. Nux vomica is most valuable; it is probably a direct stimulant to the muscular coat, hardly influencing secretion. It is largely used in cases of chronic constipation, especially when occurring in anæmic persons, or in those in

whom, for any reason, it is likely that the intestinal peristalsis is feeble.

Belladonna in small doses increases peristaltic movements because it paralyzes the inhibitory fibres of the splanchnics, but in moderate doses it completely arrests peristaltic movements. It is chiefly employed for this latter purpose, especially in combination with opium. Hyoscyamus acts on the intestines in the same way, and small doses of it are often given with other purgatives to prevent griping, for it gives an orderly rhythm to the irregular contractions which the stronger purgatives produce.

Ergot and physostigma are hardly ever used for their laxative effect.

Simple purgatives.—These are rather more powerful in their action than laxatives. They stimulate peristalsis and also increase secretion. Some of the laxatives, as castor oil and magnesia, when given in large doses become simple purgatives.

The simple purgatives are—

(1) **Aloes.**
(2) **Rhubarb.**
(3) **Rhamnus Frangula.**
(4) **[Rhamnus Purshiana.]**
(5) **Senna.**
(6) **Fel Bovis.**

These are all, except the last, in common use. The indications for each will be given under the individual drug.

Drastic purgatives, often called cathartics.—These excite greatly increased secretion and peristaltic movements, and if given in large doses cause severe irritation of the intestine, with much secretion of mucus, great vascular dilatation, and even hemorrhage, severe abdominal pain and collapse, with profuse diarrhœa. The peristaltic contractions are often irregular, and hence there may be much griping pain; therefore it is usual to prescribe hyoscyamus with these drugs, which are in order of efficiency—

(1) **Calomel.**
(2) **Podophyllum.**
(3) **[Leptandra.]**
(4) **Aloes.**
(5) **Jalap.**
(6) **Scammony.**
(7) **Gamboge.**
(8) **Oleum Terebinthinæ.**
(9) **Colocynth.**
(10) **Elaterium,** and
(11) **Croton oil.**

The most powerful are placed last. Some, as jalap, elaterium, scammony, are often called hydragogue, because of the large amount of secretion they excite.

Therapeutics.—Drastic purgatives are employed in obstinate constipation, and also to produce very watery evacuations with the object of removing as much fluid from the body as possible. Hence the frequent use of jalap in Bright's disease.

Saline purgatives.—The action of these is obscure, but it seems certain that they very greatly increase the secretion of intestinal fluid, and hinder its reabsorption, so that a large amount of it accumulates in the intestine. The distension due to this accumulation excites gentle peristalsis, and consequently an easy, painless evacuation of the bowels. Secretion goes on till the fluid in the intestine has become a 5 or 6 per cent. solution of the drug, so that if a very concentrated solution is given, much intestinal fluid is secreted. There is some doubt whether osmosis plays any part in the process. The saline purgatives are—

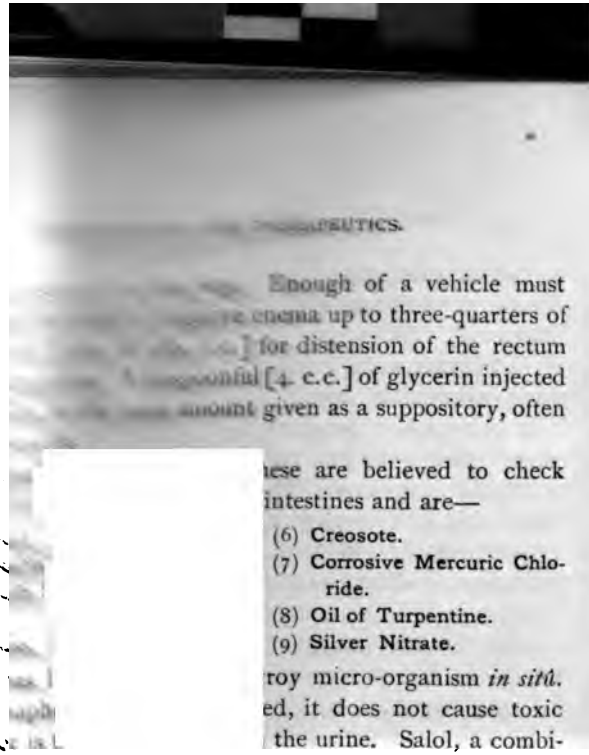
(1) **Potassium and sodium tartrate.**
(2) **Potassium bitartrate.**
(3) **Potassium sulphate.**
(4) **Sodium sulphate.**
(5) **Sodium tartrate.**
(6) **Sodium phosphate.**
(7) **Magnesium sulphate.**

Therapeutics.—These are very largely used as habitual purgatives, especially for persons suffering from any form of gout. They form the essential ingredient of most purgative mineral waters, as Hunyadi Janos, Pullna, Friedrichshall, Æsculap, Rubinat, [Villacabras], etc.

The best way of taking them is to put the required dose of the salt, or the mineral water, in a tumbler, add some lukewarm water, and sip it slowly while dressing in the morning.

Cholagogue purgatives will be described when speaking of the liver.

Enemata.—Any fluid preparation given *per rectum* is called an enema. When a purgative is liable to produce sickness, or it is inadvisable, because of peritonitis, intestinal obstruction, ulceration, or other diseases, to give it by the mouth, it may be given *per rectum*. Castor oil, aloes, olive oil, magnesium sulphate, etc.,



...PEUTICS.

...Enough of a vehicle must ...enema up to three-quarters of ... for distension of the rectum ...spoonful [4 c.c.] of glycerin injected ...amount given as a suppository, often

...ese are believed to check ...intestines and are—

(6) **Creosote.**
(7) **Corrosive Mercuric Chloride.**
(8) **Oil of Turpentine.**
(9) **Silver Nitrate.**

...roy micro-organism *in situ*. ...ed, it does not cause toxic ... the urine. Salol, a combi-... salicylic and carbolic acids, decomposes only in an alka-... secreted, and this is useful for action in the small intestine. ... water has been used for the disinfection of the intestine ... typhoid fever. Creosote is valuable if administered in the form ... coated pills, which are soluble only in the intestinal fluids. ... mercuric chloride is too poisonous for use, save in ... cases. The late George B. Wood, of Philadelphia, ... brilliant success with oil of turpentine in the treatment ... typhoid fever. Silver nitrate has a limited use as an anti-... in its local application to dysenteric ulcerations within ... in the rectum and sigmoid flexure. The intelligent use of ... foregoing drugs has greatly improved the success of the treat-... of a large number of cases of enteritis, diarrhœa, colitis, ... and typhoid fever.]

Intestinal Astringents.—These may be described under the following heads:

Astringents acting on the vessels of the intestine.—These are the same as those acting on vessels generally. Those employed for their action on the intestine are—

(1) **Lead salts.**
(2) Dilute **solutions** of silver salts.
(3) **Alum.**
(4) Diluted **sulphuric acid.**

Astringents coagulating albuminous fluids, and thus constricting the vessels :

(1) Tannic acid, and all substances containing it, as—
(2) Krameria.
(3) Kino.
(4) Hæmatoxylon.
(5) Cinnamon.
(6) Catechu, and
(7) Eucalyptus gum.
(8) Lead salts.
(9) Silver salts.
(10) Zinc salts.
(11) Bismuth salts.
(12) Copper salts, and especially
(13) Ferric salts.

Astringents diminishing the amount of intestinal fluid secreted :

(1) Opium.
(2) [Coto.]
(3) Lead salts.
(4) Calcium salts.

The precise action of these is obscure, but it is probable that they operate in the way indicated.

Astringents diminishing the contractions of the muscular coat of the intestines :

(1) Opium.
(2) Belladonna.
(3) Hyoscyamus.
(4) Stramonium.
(5) Lead salts.
(6) Lime.
(7) Bismuth salts.

Therapeutics.—The first proceeding in every case of diarrhœa is to remove its cause; if this can be done, it will probably subside. Often the cause is some irritating, indigestible food, and then it is advisable to give a mild purge, as castor oil, rhubarb, etc., to get rid of it. The majority of cases of ordinary diarrhœa are probably due to some slight enteritis, and then any one of the astringents that have been named will be valuable, for it is desirable to constrict the dilated vessels, and to diminish the secretions and the movements. Intestinal astringents are, therefore, often combined, and, when the diarrhœa is at all serious, opium is of great service. If there is a persistent cause, as tuberculous ulceration, the hope of doing good is slight. But the treatment by drugs is only a small part of the battle; if the diarrhœa is severe, absolute rest is necessary, food must be very simple and given in small quantities at a time, not much fluid should be drunk, and the patient must be kept warm.

may be administered in this way. Enough of ... always be used to make a purgative enema ... and a pint or a pint, [360. or 480. c.c.] for ... greatly aids purgation. A teaspoonful [... sub- into the rectum, or the same amount ... unlocks the bowels.

[**Intestinal Antiseptics.**— ... not follow fermentation and putrefaction in ... secreted, for ... them thoroughly ... into the duode- ...ception, which is ... Drugs which ... are called **direct** ... but this is a bad name, ... those which simply ... found in the fæces without symptoms, nor is th... cholagogues.

(1) **Naphtol.**
(2) **Naphtalin.**
(3) **Bismuth Salicylate.**
(4) **Salol.**
(5) **Chlorine.**

Naphtol has been ... When pure, naphtalin ... nation of salicylic ... have been studied in fasting, line solution, and ... into the bile-duct, and is Chlorine water ... to be experimented upon is in typhoid fever ... bile secreted before and after of enteric pil... must be given during the Corrosive ... exceptional ... considerable increase in the achieved ... of typhoid ... septic, ... reach ... the fo... men... dysp... the ... chlo- ...

(11) **Sodium salicylate.**
(12) **Sodium benzoate.**
(13) **Sodium sulphate.**
(14) **Colocynth.**
(15) **Colchicum.**
(16) **Potassium sulphate.**
(17) **Ammonium benzoate.**
(18) **Rhubarb.**
(19) **Jalap.**
(20) **Scammony.**
(21) **Diluted arsenous acid.**

... being placed first) are—

... differences among direct cholagogues. Some, as

[redacted] salicylate, make the flow very watery; with one (toluylendiamine), which is not given to man, the bile secreted is so thick that it flows through the duct with the greatest difficulty.

INDIRECT CHOLAGOGUES.—These cause no increase in the amount of bile secreted; they act by stimulating the upper part of the jejunum and the lower part of the duodenum, thus sweeping the bile on before there is time for it to be re-absorbed.

They are—(1) **Mercury**, (2) most **Cathartic purgatives**, especially **Calomel.**

Therapeutics. Cholagogues are used for cases of dyspepsia in which there is reason to believe that the liver is the organ at fault, and certainly they often have a very markedly beneficial effect. It is clearly an advantage to combine direct and indirect cholagogues in order to insure that the bile shall be excreted. As bile itself is a stimulant to the peristaltic movements of the intestine, all cholagogues are purgatives, and form a distinct class of purgatives. In cases of hepatic dyspepsia attention to diet is of the greatest importance, and muscular movements, as riding, rowing, etc., aid in the expulsion of bile from the gall-bladder and ducts.

ANTI-CHOLAGOGUES.—These are often called hepatic depressants. They decrease the quantity of bile secreted. Calomel, castor oil, gamboge, magnesium sulphate, opium and lead acetate have this effect, but it is not sufficiently marked to interfere with their therapeutic use for other purposes, and they are never employed for this action.

Drugs modifying the glycogenic function of the liver.—We will here refer to those drugs which cause sugar to appear in the urine, and to those drugs which diminish the glycogenic function of the liver.

DRUGS CAUSING SUGAR TO APPEAR IN THE URINE.—Until recently it was assumed that all these drugs acted on the liver, probably by increasing the amount of sugar made from the hepatic store of glycogen; but now we have reasons for thinking that sometimes the pancreas may be the organ at fault in diabetes, for its excision causes sugar to appear in the urine, and other

E. Drugs acting on the Liver.—The liver ... perhaps distinct functions, viz.: (*a*) to secrete bile; (*b*) ... may cause store up glycogen; (*c*) to form urea; (*d*) to ex... sugar absorbed from the intestine; and (*e*) to destro... What stances absorbed from the intestine.

... drugs will

1. *Drugs influencing the secretion of bile* ... because more bile appears in the fæces that ... it may be that the gall-bladder and duct... must, in most emptied, or that the bile which has bee... Glycuronic acid, num has been swept along quickly by... sugar, but differs ordinarily brisk, has had time to ... after the admin- increase the amount of bile actu... and curare, and it is quite **cholagogues, or hepatic stimu**... they have stated that as the liver has so many distinc... which occurs in the urine lead to a larger amount of bile ... Leucin and uric acid any extra secretion are called h... never employed with the

DIRECT CHOLAGOGUES.—... FUNCTION.—**Phosphorus, arse-** curarized dogs. A cannula ... formation of glycogen by the brought out of the body, ... In certain forms of diabetes, administered, and the ... marked effect in diminishing the administration is no... experiment, as that ... *of urea by the liver.*—It is biliary flow.

Direct cholag... ...nogenous substances, especially ... converted into urea. The (1) Podophy... ...urine is increased by phosphorus, (2) Euony... ...chloride, and iron. Phosphorus (3) Iridin... ...in the urine of leucin and tyro- (4) [illegible] ...this drug causes an increase of (5) Aloes ...the liver, for in phosphorus poison- (6) Ta... ...fatty degeneration, and jaun- (7) Bi... (8) ... ...the other drugs act through the liver ... and arsenic, if given in large doses for ... fatty degeneration. All these ... in almost poisonous doses in ... the urine, and they are not employed

...in, alcohol, and quinine are said to increase ... reted.

... ACTING ON THE NERVOUS AND MUSCULAR SYSTEMS.

... Drugs acting on the Muscles.—Pharmacologists have ... much attention to this class of drugs; but as the facts ... and are not used in medicine, we need not stop to con... them. Brunton gives the following classification, founded on that of Kobert;

Class I. *Irritability of muscle unaffected; total amount of work it can do diminished.*—The following produce this effect: Apomorphine, delphinine, saponin, copper, zinc, and cadmium. And in large doses antimony, arsenic, platinum, and iron.

Class II. *Both the irritability and the capacity for work diminished.*—The following produce this effect: Potassium, lithium, ammonium, quinine, alcohol, chloral, and chloroform.

Class III. *Diminish the capacity for work, and make the excitability very irregular.*—Lead, emetine, and cocaine.

Class IV. *Alter the form of the muscle curve.*—Veratrine, barium, strontium, and calcium salts, digitalis, and squill.

Class V. *Increases the excitability.*—Physostigmine.

Class VI. *Increase the capacity for work.*—Caffeine and theobromine.

Small doses of strychnine and veratrine shorten the latent period; large doses lengthen it.

Dilute alkalies diminish the extensibility; dilute acids increase it.

B. Drugs acting on the Peripheral Endings of Motor Nerves.—Of the drugs belonging to this group the action of curare has been worked out most fully. If curare is given to an animal, it is found that the muscles will respond to a mechanical stimulus, although they will not contract when the motor nerve is stimulated. If a single muscle be removed from the circulation by ligature of its vessels before the administration of curare, afterwards it will be the only one that will respond to stimulation of its motor nerve. As this was the only muscle of the body that the drug could not reach, and it is the only one not poisoned, the poison clearly acts locally on the muscles; but as the curarized muscle will respond to mechanical stimulation, curare

must paralyze the motor nerves within the muscle, probably the end plates.

Drugs paralyzing the termination of the motor nerves in muscle:

(1) Curare.
(2) Conium.
(3) Belladonna, (atropine).
(4) Stramonium.
(5) Hyoscyamus.
(6) Saponin.
(7) Sparteine.
(8) Amyl nitrite.
(9) Diluted hydrocy
(10) Cocaine.
(11) Camphor.
(12) Lobeline.
(13) Nicotine.
(14) Methyl-brucine.
(15) Methyl-cinchonine.
(16) Methyl-codeine.
(17) Methyl-morphine.
(18) Methyl-quinine.
(19) Methyl-nicotine.
(20) Methyl-strychnine,
and many others.

Curare and conium most important. Therapeutically we never desire to paralyze gs.

Drugs stimulating of motor nerves in muscle:

(1) Aconite.
(2) Nicotine.
(3) Pilocarpine.
(4) Pyridine.
(5) Strychnine (slightly).

Excepting that perhaps some of the beneficial action of strychnine in certain cases may be due to its slight action on motor nerves, we do not employ these drugs for this action.

C. Drugs acting on the Peripheral Endings of Sensory Nerves (other than those of special sense).—Our knowledge of these is derived almost entirely from observations on man, for it is very difficult to experiment upon animals, as they have such imperfect means of communicating their sensations to us.

Drugs which stimulate the termination of sensory nerves.—These, when applied locally, cause pain. They are the same as the local vascular irritants which have already been enumerated (p. 57); in fact, most of them give rise to pain by causing local inflammation. There is no need to repeat the list.

Therapeutics.—Local irritants are chiefly employed for their action on the vessels, but as they are also counter-irritants, their application to the skin, while causing some pain there, will often relieve a deep-seated pain. Although pain is always re-

(1) Lead. | (3) Arsenic.
(2) Mercury. | (4) Alcohol.

8. Drugs acting on the Spinal Cord.

of experiment are so great that we know noth
of drugs on the sensory portions of the cord.
rant of the action of drugs on the motor fibres
method is adopted to discover whether a drug
of the anterior cornua. Suppose we are study
stimulates the motor cells. After the drug h
slight peripheral stimulus will produce such mar
that convulsions will ensue upon the stimulation
cut across and the convulsions follow the stimul
clear that these cannot be of cerebral origin,
they would not take place below the point of se
before injection of the drug into the circulati
the cord are ligatured, and then the drug cause
it is clear that it acts on the cord, and not on
nerves. These results are confirmed, if, when th
into vessels by which it reaches the cord qui
occur sooner than when it is thrown into othe
convulsions do not take place when the cord is
lastly if, when the destruction is gradually caus
wire down the vertebral canal, the convulsions
downwards as the cord is destroyed.

Therapeutics.—It is very rarely that we can do any good in spinal diseases by attempting to stimulate the anterior cornua; but strychnine is occasionally given for cases of paralysis due to diseases of the spinal cord.

Drugs which depress the activity of the anterior cornua:

(1) **Physostigmine.**
(2) **Bromides.**
(3) **Alcohol.**
(4) **Chloroform.**
(5) **Ether.**
(6) **Ergot.**
(7) **Opium.**
(8) **Mercury.**
(9) **Zinc salts.**
(10) **Silver salts.**
(11) **Sodium salts.**
(12) **Potassium salts.**
(13) **Lithium salts.**
(14) **Antimony salts.**
(15) **Arsenical salts.**
(16) **Camphor.**
(17) **Amyl nitrite.**
(18) **Sodium nitrite.**
(19) **Chloral.**
(20) **Carbolic acid.**
(21) **Apomorphine.**
(22) **Veratrine.**
(23) **Turpentine.**
(24) **Saponin.**
(25) **Emetine.**
(26) **Gelsemium.**

Of these, apomorphine, alcohol, chloroform, ether, arsenic, camphor, morphine, carbolic acid, chloral, nicotine, and veratrine first excite slightly before depressing.

Therapeutics.—These drugs are of very little use in medicine for their action on the spinal cord. Physostigmine is by far the most powerful, and has been occasionally used in obscure nervous diseases accompanied by convulsions, as tetanus.

Ergot has a very peculiar action in producing sclerosis of the posterior columns of the cord. Lead sometimes causes atrophy of the anterior cornual cells, and long-continued abuse of alcohol probably causes slight degeneration of the cord as a whole.

F. Drugs acting on the Brain.—The action of these cannot be localized nearly so accurately as can that of drugs acting on the spinal cord and nerves. Drugs acting on the brain illustrate two very important general laws.

First, the **law of dissolution,** which, when stated as it applies in pharmacology, is as follows: When a drug affects functions progressively, those first affected are the highest in development; that is to say, they are the last acquired by the individual and the last to appear in the species. The next affected

that he gesticulates, throws his arms about wildly, and tosses his body. By this time the brief stimulation of the higher intellectual faculties has probably ceased, and, in obedience to the second law, vision, hearing, and touch are dulled, and he has lost control over his reason, so that he feels light-headed, as he expresses it, crying and laughing easily; now he is totally irresponsible for his actions and careless as to their results. It will be noticed that the functions are paralyzed in the order stated in the law of dissolution. Next there follows upon the stimulation of the motor areas, stimulation of the heart and respiration. The pulse and respiration both increase in number, the blood-pressure rises, the face flushes. Then comes depression of all the functions previously excited; first the higher parts of the cerebrum give way, and the patient loses consciousness—neither bright lights, sounds, nor painful impressions arouse him; he becomes quiet, and ceases to throw his arms and legs about; the reflexes disappear, and consequently touching the conjunctiva does not produce closing of the eyelids; the feet do not move when they are tickled, the pupil is contracted, and the previous quickening of the pulse and respiration are succeeded by a slowing of their rate. It is at this period that the patient cannot feel pain, and that therefore operations are performed. The depression of the motor centres is followed by the depression of the muscular tone, and the muscles become quite flaccid and cease to respond to mechanical stimulation. This is the degree of narcosis that is required for the easy reduction of dislocations and for the easy manual examination of the abdominal viscera. Anæsthetics should not be pushed beyond this stage. If they are, even the involuntary muscles lose their tone and reflex excitability, so that the sphincters of the rectum and the bladder relax. The depression of the pulse and respiration continues, the movements of the chest become weaker and weaker, and slower and slower, the pulse becomes very feeble, slow, and irregular, and the heart finally stops in diastole. Death occurs partly by the heart and partly by the respiration. At any period of the administration during which recovery is possible, the functions of the body will return

Another law very well exemplified by d
the brain is that when a drug in moderate do
tion, in large doses it often paralyzes it. For
under the influence of chloroform, soon after
tosses his arms about in a disorderly way, but
become motionless, and cerebral stimulants may

Drugs acting on the motor centres of the brai
these, the motor area of the cortex is exposed
the strength of current which it is necessary to
area to produce corresponding movements, is
after the administration of the drug. Anot
observe the strength of current necessary to e
then to allow the wound [made by the trephir
wards the animal is made to take the drug
weeks. The opposite motor area is then exposed
of current required to call forth movements is

It has been found that—

(1) **Alcohol.**
(2) **Anæsthetics.**
(3) **Chloral.**
(4) **Potassiu**
(5) **Sodium**
(6) **Ammon**

diminish the activity of the cells of the motor area.

Bromides are largely used in epilepsy and
disorders on account of this function.

Drugs exciting the motor cells of the cortex are—
(1) **Atropine** (2) **Strychni**

general excitation of the mental faculties, followed in many cases by delirium and incoherence. The exact form of delirium differs a little in each case.

Such drugs are—

(1) **Belladonna.**
(2) **Stramonium.**
(3) **Hyoscyamus.**
(4) **Alcohol.**
(5) **Chloroform.**
(6) **Ether.**
(7) **Nitrous oxide.**
(8) **Coffee.**
(9) **Tea.**
(10) **Guarana.**
(11) **Coca.**
(12) **Cannabis Indica.**
(13) **Lupulus.**
(14) **Opium.**
(15) **Camphor.**
(16) **Santonin.**
(17) **Quinine.**
(18) **Salicylic acid.**
(19) **Tobacco.**

Therapeutics.—Many of these are taken habitually as cerebral stimulants; for example, alcohol, tea, coffee, tobacco, in England; opium in the East; cannabis indica in many parts of Asia; coca in parts of South America; and if it is wished to give a cerebral stimulant as a drug, one of these is usually chosen. The rest, which are very important, are commonly employed for some other action. With very many of this class of drugs, as will be seen directly, the stimulant action soon gives way to a paralyzing influence.

General cerebral depressants.—These are commonly divided into three classes: Hypnotics or Soporifics, Narcotics, and Anæsthetics.

Hypnotics or Soporifics are drugs which produce sleep, closely resembling, if not identical with, natural sleep. The brain during sleep is anæmic, and it is thought that this anæmia is the cause of sleep; possibly some soporifics act by producing cerebral anæmia.

The hypnotics are—

(1) **Opium.**
(2) **Morphine.**
(3) **Chloral.**
(4) **Butyl-chloral hydrate.**
(5) **Bromides.**
(6) **Hyoscyamus.**
(7) **Cannabis Indica.**
(8) **Paraldehyde.**
(9) **Sulphonal.**
(10) **Chloralamid.**
(11) **Urethane.**
(12) **Lupulus.**
(13) **Alcohol.**
(14) **Lactucarium.**
(15) [**Piscidia.**]

it shows that its action is central, and that it
into the eye because some of it is absorbe
proved by these means to act centrally, the fu
is difficult, for the central mechanism is comp

If it has been proved to act locally, it ma
muscular fibres of the iris, on the terminations
in them, or on the terminations of the cervic
them. Stimulation of the third nerve causes
tract; section of it causes the pupil to dilate.
sympathetic causes the pupil to dilate; sectio
pupil to contract. If the pupil is dilated by
a drug, and stimulation of the third nerve wi
contract, but yet the muscle is responsive to m
tion, it shows that the endings of the third ne
If the pupil is contracted by the drug, and, al
to mechanical stimulation, will not dilate when
cut, it shows that the ends of the third nerve a
a drug locally dilates the pupil, but not as pow
tion of the sympathetic, it is clear that its whol
to a stimulation of the sympathetic; and if th
locally irritable, the third nerve ending must
series of similar experiments may be made w
sympathetic. By these means the mode of acti
has been made out, but often they act both o
and the third nerve. In the following list thes

Mydriatics (dilate the pupil)—

A. Paralyze the termination of the third nerve.

(1) **Atropine.**
(2) **Homatropine.**
(3) **Daturine.**
(4) **Hyoscyamine.**
(5) **Gelsemine** (probably).
(6) **Muscarine** (probably).

B. Stimulate the terminations of the sympathetic.—**Cocaine.**

C. Act centrally.—**Anæsthetics** (late in their action).

Myotics (contract the pupil)—

A. Stimulate the terminations of the third nerve.—**Physostigmine, pilocarpine, nicotine** (probably).

B. Act centrally.—**Anæsthetics** (early in their action), Opium.

Therapeutics.—Dilators of the pupils, especially atropine and homatropine, are used to dilate the pupil for ophthalmoscopic examination, and to prevent or break down adhesions of the iris. Contractors of the pupil, especially physostigmine, are used to overcome the effects of atropine [to prevent or break down adhesions of the iris], and to prevent too much light entering the eye in painful diseases of it.

2. DRUGS ACTING ON THE CILIARY MUSCLE.—The following drugs impair or paralyze accommodation:

(1) **Atropine.**
(2) **Daturine.**
(3) **Hyoscyamine.**
(4) **Homatropine.**
(5) **Cocaine.**
(6) **Physostigmine.**
(7) **Pilocarpine.**
(8) **Gelsemine.**

Intra-ocular tension is increased by atropine (large doses), hyoscyamine, and daturine. It is decreased by cocaine and physostigmine.

Gelsemine paralyzes the external ocular muscles, especially the levator palpebræ and the external rectus, by its action on the terminal nerve filaments.

The capacity for seeing blue is increased by strychnine. Santonin causes first violet, then yellow vision.

H. Drugs acting on the Ears.—We know very little about the action of drugs on them. Quinine and salicylic acid cause noises and buzzing.

J. Drugs acting on Sympathetic System.—Much of

A. Aphrodisiacs.—These are substan
sexual desire. There are conceivably many
might take place. There is a centre in the
irritation of which causes erection, and this
excited by afferent impulses proceeding from
body, but especially from the cerebrum, and
themselves, or the parts in their immediate n
lumbar centre appears to be very dependen
health, and therefore substances which improv
aphrodisiacs.

The following drugs are known as aphrodisiacs; not certainly known:

(1) **Strychnine.**
(2) **Cantharides.**
(3) **Alcohol.**
(4) **Cannabis Indica.**
(5) **Camph**
(6) **Phosp**
(7) **Damia**

B. Anaphrodisiacs.—We do not knov
drugs which have a depressant effect upon
Most anaphrodisiacs act by decreasing or ren
tion which is reflexly producing an aphrodisi
probably act centrally.

Drugs used as anaphrodisiacs are—

(1) **Bromides.**
(2) **Potassium iodide.**
(3) **Opium.**
(5) **Hyosc**
(6) **Stramo**
(7) **Digital**

They are—

(1) Ergot.
(2) Quinine.
(3) Savine.
(4) Hydrastis.
(5) Rue.
(6) Powerful purgatives.

Of these ergot is by far the most important. Occasionally some of these drugs will act upon the gravid uterus to produce abortion before parturition has begun. They have all of them been used criminally for this purpose.

D. Emmenagogues are substances used to increase the menstrual flow. Diminution of the menstrual flow is a symptom of so many diseases that a large number of drugs which remedy these are indirect emmenagogues, but the substances which seem to have a special action in increasing the menstrual flow are—

(1) [Savine.
(2) Rue].
(3) Asafœtida.
(4) [Apiol].
(5) Myrrh.
(6) Guaiacum.
(7) Cantharides.
(8) Borax.
(9) [Tansy].

Among the many indirect emmenagogues the commoner are purgatives, iron, manganese, cod-liver oil, and strychnine, which act by improving the general health. Hot foot- or hip baths, especially if mustard be added, often aid the onset of menstruation.

E. Substances which depress Uterine Action.—These are employed to restrain the contractions of the gravid uterus. They are—

(1) Bromides.
(2) Opium.
(3) Chloral.
(4) [Viburnum].
(5) Cannabis Indi a.
(6) Chloroform.
(7) Antimony and potassium tartrate.

F. Drugs acting on the Secretion of Milk.

Galactogogues, or drugs which increase the secretion of milk.

Pilocarpus, [Leaves of Ricinus Communis,] and Alcohol—Of these pilocarpus is the most powerful, but its effects soon pass off. [The leaves of the castor-oil plant are used, applied as a poultice, and a decoction, or the fluid extract of them, given internally at the same time.] Alcohol is very feeble. The secretion is so much under the control of the general health that the best way to insure an abundant secretion is to keep the general health as good as possible.

mercury, zinc and potassium iodide. It is clear that the
with care to the mother; for example, copaiba or tu
milk so [unpleasant] that the child will not take it.
given to the mother, may cause diarrhœa in the child.
given in large doses to the mother. On the other hand
potassium iodide may be administered to the child by b

Division XII.—Drugs acting on M

Our knowledge of the normal metabolism
imperfect, consequently we know very little mo
been stated under other divisions, about the
metabolism. Any further remarks which are
made when the individual drugs are considere
common use are alterative and tonic.

Alterative is a vague term of which no definition
often used to cloak our ignorance, when we have no ex
action of a drug. Many drugs comprehended under th
perty of profoundly altering the body, especially if it be
mercury will, if the patient be suffering from syphili
absorption of syphilitic exudations, but we do not know
All that can be said about such drugs will be stated und
of action is probably so different, that no useful purpos
considering them together.

Tonic.—This is a term even more vague than alte
is it, that it is advisable never to use it if it can be av
employed, it means a drug which makes the patient feel
than he did before he took it. Obviously this may happ

PHARMACOPŒIAL MATERIA MEDICA

(For Non-pharmacopœial, *see* Appendix I. and II.)

PART I.—INORGANIC MATERIA MEDICA.

GROUP I.

Aqua, Hydrogenii Dioxidum.

I. AQUA, [Water, H_2O=17.96.—Natural water in its purest attainable state.

CHARACTERS.—A colorless, limpid liquid, without odor or taste at ordinary temperature, and remaining odorless while being heated to boiling.

AQUA DESTILLATA.—Distilled water, H_2O=17.96.

SOURCE.—Take 1000 volumes of water, distil from a suitable apparatus provided with a block tin or glass condenser, reject the first 100 volumes, which contain volatile impurities, and preserve the next 800 in glass-stoppered bottles, rinsed with hot distilled water immediately before being filled.

CHARACTERS.—A colorless, limpid liquid, without odor or taste, and perfectly neutral to litmus paper.

TESTS.—Evaporated in a clean glass capsule on a water bath, no residue should remain. It is not affected by Hydrogen or Ammonium Sulphide (absence of *metallic impurities*), Ammonium Oxalate (*Calcium*), Silver Nitrate (*Chlorides*), Barium Chloride (*Sulphates*), or Mercuric Chloride (*Ammonia*), nor should its transparency be affected when mixed with twice its volume of Calcic Hydrate test solution (absence of *Carbon Dioxide*). In heating to boiling and acidulating with diluted Sulphuric Acid and adding a one-tenth of one per cent. solution of Potassium Permanganate, the color produced is not entirely destroyed by boiling five minutes nor by afterwards setting the vessel aside, well covered, for ten hours (absence of *organic* or *other oxidizable matters*)]. Aqua Destillata is always to be used for making up prescriptions

duction of fats. The amount of carbon increased. The rate of the pulse and respi but they soon fall. The skin becomes pale, a goose-skin is seen. After the bath (the dur ture suitable for different persons vary widel of warmth and exhilaration, and the cutar [reaction].

A warm bath, if sufficiently prolonged, ma of the bodily temperature, the skin becomes respiration are more frequent, the amount o diminished, and after the bath there is profus

Internal.—Warm water gives rise to na hot water, taken in small quantities at freq check both. Water is quickly absorbed fro very soon afterwards the amount of urine increased, and to a less degree the amount juice, and saliva. Large quantities of fluid s during meal times, as that impairs digestion. amount of water is drunk daily the amount o increased, and that of uric acid is diminished washes out the tissues, but apparently rende phosis more complete.

THERAPEUTICS.

External.—*Cold baths* are used for the rating effects, which may be increased by [br

immediately follow a cold bath should not use it. The constant daily use of a cold bath probably diminishes the liability to catch cold. Cold baths are said to arrest attacks of laryngismus stridulus. They have been largely used to reduce the temperature in fever, especially **typhoid fever.** The first effect of putting the patient in the cold water is to cause, reflexly from the stimulation of the skin by the cold, an increased production of heat; for this reason and because of the cessation of radiation, the rectal temperature at first rises a little, but soon, owing to the direct abstraction of heat, and to the diminished production of heat which quickly sets in, it falls rapidly, and continues to do so after the patient is taken out. The temperature of a bath for a patient with typhoid fever should be between 68° and 58° F. [20° and 14.4° C.]; he should be lowered into it by a sheet, and remain in ten minutes, unless before that time he shows signs of collapse, he is then lifted back to bed, where a blanket is thrown loosely over him. If this treatment is adopted the bath ought to be given whenever the axillary temperature is 103° F. [39.4° C.]. Sometimes the patient is placed in a bath at a temperature of 10° F. [5.5° C.] below his own, and the water is cooled by putting in cold water or ice, till it has fallen to about 68° F. [20° C.], when he is taken out. Often, instead of having a bath, he is sponged with cold water as he lies in bed; this saves trouble, but both sponging and a cold pack (which consists of a sheet four folds thick, wrung out in cold water and wrapped round the naked body for five or ten minutes) are inferior to a bath. **Pneumonia** is often treated by the application of cold, generally by means of ice poultices (pounded ice in a thin, flat, india-rubber bag), applied to the chest. The immediate action of very cold baths is far the best treatment for any sudden **hyperpyrexia.**

Cold is applied **locally** either by cold water in Leiter's coils or by ice bags, in a number of conditions, with the object of arresting inflammation. Thus ice bags are put on the head in meningitis, or concussion, and on the knee-joint for acute synovitis, etc. According to most authorities, cold contracts not only the vessels of the skin to which it is applied, but by reflex action

THE THERAPEUTICS OF HYDROGEN DIOXIDE.

It seems to have a favorable action in some forms of dyspepsia, and improves digestion. In diphtheria it is useful as a cleansing agent, but should be used in glass or hard rubber instruments. Some commercial preparations are very acid, and therefore too irritating for this purpose. It is of great value in cleansing wounds, fistulous tracts, and for surgical dressings; the cessation of frothing indicates the destruction of pus. Hydrogen Peroxide should not be injected into a suppurating cavity unless there is a free outlet for the escape of the gas which is formed.]

GROUP II.

THE ALKALINE METALS.

Potassium, Sodium, Ammonium, Lithium.

I. POTASSIUM.

K = [39.03.

1. **POTASSA.**—KOH = 55.99. *Synonyms.*—Potassium Hydrate. Potassium Hydroxide. Caustic Potash.

SOURCE.—Evaporate Liquor Potassæ, fuse the residue and pour into clean cylindrical moulds which have been previously warmed.

CHARACTERS.—Dry, white, translucent pencils, or fused masses, hard and brittle, showing a crystalline fracture; odorless, or having a faint odor of lye, and of a very acrid and caustic taste. Great caution is necessary in tasting and handling it, as it rapidly destroys organic tissues. Exposed to the air, it rapidly absorbs Carbon Dioxide and moisture, and deliquesces.

IMPURITIES.—Organic matter, arsenic, lead, iron, soda, aluminum, calcium, chlorides, sulphates, silicates, carbonates, and nitrates.

Preparations.

1. **Liquor Potassæ.**—Solution of Potassa. *Synonym.*—Solution of Potassium Hydrate. An aqueous solution of Potassium Hydrate (HOH = 55.99), containing about 5 per cent. of the hydrate.

SOURCE.—Dissolve Potassium Bicarbonate in distilled water, slake the lime and dissolve in distilled water, boil, strain when cold; when it has become clear from subsidence, decant or siphon off the clear solution. $K_2CO_3 + Ca(OH)_2 = 2KOH + CaCO_3$. Or it may be pre-

pared from a solution of Potassa (56 parts of the full strength, directed by the U. S. P., 90 per cent.) in distilled water (944 parts)].

CHARACTERS.—A clear colorless liquid, odorless, having a very acrid and caustic taste, and a strong alkaline reaction. Sp. gr. about 1.036.

IMPURITIES.—*See* Potassa.

INCOMPATIBLES.—Acids, acid salts, metallic salts and preparations of Ammonia, Belladonna, Hyoscyamus and Stramonium, the alkaloids of these three being decomposed by Caustic Potash. All alkaloids are precipitated by alkalies.

Dose, 5 to 30 m.; [.30 to 2.00 c.c.], freely diluted.

2. Potassa Cum Calce.—[Potassa with Lime. Potassa, 500; Lime, 500. Rubbed together in a warm, iron mortar.

CHARACTERS.—A grayish-white powder, deliquescent, having a strongly alkaline reaction, and responding to the tests for Calcium and Potassium. *Solubility.*—In diluted hydrochloric acid without leaving more than a small residue.]

ACTION OF POTASH.

External.—It is, if concentrated, a powerful **irritant** and **caustic**, acting by abstracting water from the part to which it is applied. It dissolves fatty matters that may be present on the surface. It is **antacid**, and, if freely diluted, **sedative.**

Internal.—*Mouth.*—As alkalies check alkaline secretions, potash momentarily checks the secretion of saliva.

Stomach.—Because alkalies stimulate acid secretions, the flow of gastric juice is **excited**, if alkalies are given before a meal, but if at the end of or after a meal the gastric juice already secreted is **neutralized.** Being readily diffusible, alkalies are quickly absorbed.

Blood.—This is rendered more alkaline. Probably all alkalies circulate in the blood as carbonates, but their action as alkalizers of the blood is very transitory, for they are quickly excreted. The amount of hæmoglobin, if it is deficient, is said to be increased.

Heart.—Large amounts of salts of potassium are **depressant** to all muscular tissues, and therefore decrease the force of the

heart, ultimately causing diastolic arrest by direct action on the cardiac muscle.

Kidney.—Potassium salts are **diuretic,** acting directly on the renal epithelium. They are quickly excreted in the **urine,** rendering it **alkaline,** and thus increasing its power of holding uric acid in solution.

Respiratory passages.—The bronchial secretion is **increased** in quantity, and it is rendered less viscid.

Muscle.—The prolonged contraction produced by veratrine, or barium salts, is abolished by potassium salts. They are direct **muscular depressants,** and depress also the nervous system, especially the brain and spinal cord.

Therapeutics of Potash.

External.—Caustic potash is used to destroy lupus, and it was formerly employed to make issues. Care must be taken to limit its action, for it diffuses very rapidly. Liquor potassæ is used to dissolve off the fatty matters, and thoroughly cleanse the skin before operations, and weaker solutions of it are employed to remove the epidermis in certain chronic skin diseases. A 40 per cent. solution is recommended to remove an in-growing toe-nail, which is painted with the fluid, and in a few seconds is so softened that much can be scraped off. The procedure is repeated till the nail that remains is sufficiently thin to be removed with a pair of fine scissors. Dilute solutions, acting as sedatives, relieve itching.

Internal.—To obtain the effects of alkalies upon internal organs, the potassium bicarbonate, citrate and acetate are preferable to potash, for that is apt to irritate the stomach; but it is occasionally used in small doses as a gastric sedative for dyspepsia.

Toxicology, see *Soda, p.* 128.

2. **POTASSII CARBONAS.**—[Potassium Carbonate. K_2CO_3 = 137.91. *Synonym.*—Salts of Tartar.

Source.—Pearlash, which is a product of the lixiviation of wood ashes, is treated with water, which dissolves little but potassium carbonate, and the solution is evaporated.

CHARACTERS.—A white, granular powder, odorless, having a very strong alkaline taste; very deliquescent. *Solubility.*—In 1.1 parts of water, and in 0.65 part of boiling water; insoluble in alcohol.

IMPURITIES.—Sulphates, chlorides, nitrates, cyanides, earthy and metallic matters.

Potassium Carbonate is used in preparing Mistura Ferri Composita, Pilulæ Ferri Carbonatis (in which Ferrous Carbonate is formed), and Potassa Sulphurata.

Dose, 5 to 30 gr.; .30 to 2.00 gm.]

ACTION AND THERAPEUTICS OF POTASSIUM CARBONATE.

These are the same as those of potash; but the carbonate is less caustic.

3. **POTASSII BICARBONAS.**—[Potassium Bicarbonate. $KHCO_3 = 99.88$.

SOURCE.—Pass Carbon Dioxide through a solution of Potassium Carbonate, and let the bicarbonate crystallize out. $K_2CO_3 + CO_2 + H_2O = 2KHCO_3$.

CHARACTERS.—Colorless, transparent monoclinic prisms, odorless, and having a saline and slightly alkaline taste. Permanent in the air. *Solubility.*—In 3.2 parts of water; almost insoluble in Alcohol.

IMPURITIES.—The carbonate, chlorides, and iron.

Potassium Bicarbonate is used in preparing Liquor Potassii Arsenitis, Liquor Potassii Citratis, and Potassii Citras Effervescens.

Dose, 5 to 60 gr.; .30 to 4.00 gm.]

ACTION OF POTASSIUM BICARBONATE.

Potassium bicarbonate is too feebly caustic to be of any use for this purpose. Otherwise its actions are those of potash.

THERAPEUTICS OF POTASSIUM BICARBONATE.

Stomach.—Potassium bicarbonate may be given before meals to stimulate the flow of gastric juice; and as it is a gastric sedative, it is useful in painful dyspepsia accompanied by a scanty secretion of gastric juice. It may be taken **after meals if too much acid** is secreted, and the patient suffers from acid eructations, especially if pain be present also; but it is better treatment to remove the cause of the dyspepsia. It is not a common

remedy for dyspepsia, sodium bicarbonate being usually preferred. It should not be used as an alkali in cases of poisoning by mineral acids, because of the evolution of carbon [dioxide].

Blood.—Potassium bicarbonate circulates in the blood as the carbonate. It was formerly much used in rheumatic fever, but is now superseded by salicylates. Probably it did no good. In **gout** it is given to keep the blood **thoroughly alkaline,** and thus to dissolve the uric acid which is in excess in the plasma. Many of the mineral waters useful for gout owe part of the efficacy to their potassium salts. It is believed to be hæmatinic, that is to say, it is thought to increase the amount of hæmoglobin; but as for this purpose it is usually given with iron, its hæmatinic power has not yet been proved.

Kidneys.—It is not much used for its diuretic effect and its alkalizing power over the urine, as the vegetable salts are preferable.

4. POTASSII ACETAS.—[Potassium Acetate. $KC_2H_3O_2$=97.89.

SOURCE.—Add Acetic Acid in excess to Potassium Carbonate or Bicarbonate. Evaporate to dryness and fuse the residue. $K_2CO_3 + 2HC_2H_3O_2 = 2KC_2H_3O_2 + H_2O + CO_2$. Or, if the bicarbonate, which is preferable, is used, $KHCO_3 + HC_2H_3O_2 = KC_2H_3O_2 + H_2O + CO_2$.

CHARACTERS.- A white powder or crystalline masses of a satiny lustre, odorless and having a warming saline taste, very deliquescent. *Solubility.*—In 0.36 part of water, and in 1.9 parts of Alcohol.

IMPURITIES.—The carbonate and metallic impurities.

Dose, 5 to 60 gr.; .30 to 4.00 gm.]

5. POTASSII CITRAS.—[Potassium Citrate. $K_3C_6H_5O_7 + H_2O$ = 323.59.

SOURCE.—Neutralize Potassium Carbonate with a solution of Citric Acid, and evaporate to dryness. $3K_2CO_3 + 2H_3C_6H_5O_7 = 2K_3C_6H_5O_7 + 3H_2O + 3CO_2$.

CHARACTERS.—Transparent, prismatic crystals or a white, granular power, odorless and having a cooling, saline taste. Deliquescent on exposure to the air. *Solubility.*—In 0.6 part of water; sparingly in Alcohol.

IMPURITIES.—Carbonates, chlorides, and tartrates.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

Preparation.

Liquor Potassii Citratis.—Solution of Potassium Citrate. *Syn-*

onym.—Mistura Potassii Citratis. Citric Acid, 6; Potassium Bicarbonate, 8; water to 100. The acid and the bicarbonate are dissolved separately and the solutions mixed. It contains about 9 per cent. of anhydrous Potassium Citrate.

Dose, 1 to 8 fl. dr.; 4. to 30. c.c.

6. **POTASSII CITRAS EFFERVESCENS.**—Effervescent Potassium Citrate. Citric Acid, 63; Potassium Bicarbonate, 90; Sugar, 47.

SOURCE.—Powder the ingredients separately, and mix them thoroughly in a warm mortar. Dry the resulting, uniform paste rapidly, and, when it is perfectly dry, reduce it to a powder of the desired degree of fineness. $H_3C_6H_5O_7 + 3KHCO_3 + H_2O = K_3C_6H_5O_7 + 3CO_2 + 4H_2O$.

CHARACTERS.—A fine, white powder, odorless, and having a sweetish, saline taste. *Solubility.*—Completely in water, with effervescence.

Dose, 5 to 60 gr.; .30 to 4.00 gm.]

ACTION OF POTASSIUM CITRATE AND ACETATE.

External.—No action. Being neutral, they are not even antacid.

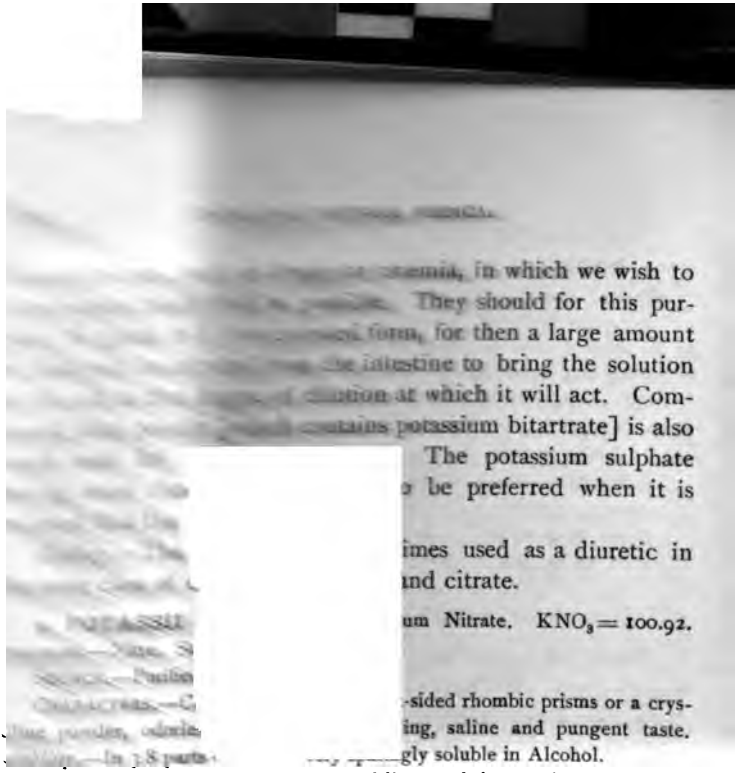
Internal.—These are the least irritating to the stomach of all potassium salts; being neutral, they have no action on gastric juice. They circulate as potassium carbonate. Both are more powerfully **diuretic** than any other potassium salts, and act by directly stimulating the renal cells. They are **diaphoretic**, especially the citrate; but neither of them causes a great increase of the perspiration. How they produce this effect is not certainly known.

THERAPEUTICS OF POTASSIUM CITRATE AND ACETATE.

As neither impair digestion, they are chiefly used for remote effects.

Blood.—They have been largely given for rheumatic fever, but are now not employed. Both salts are of great value in **gout**, for they keep in solution the excess of uric acid in the plasma. They are powerfully **anti-scorbutic**; that is to say, they prevent scurvy; but they are not so efficacious as lemon juice, lime juice, and fresh vegetables.

Kidneys.—Although in health the diuresis produced by the



...ia, in which we wish to
... They should for this pur-
... form, for then a large amount
... intestine to bring the solution
... which it will act. Com-
... potassium bitartrate] is also
The potassium sulphate
... be preferred when it is

...imes used as a diuretic in
...nd citrate.

...um Nitrate. $KNO_3 = 100.92$.

...-sided rhombic prisms or a crys-
...ing, saline and pungent taste.
...gly soluble in Alcohol.

...—Sulphates, chlorides and lime, and the metals.
Potassium Nitrate is used to prepare Argenti Nitras Dilutus.
Dose, 5 to 20 gr.; .30 to 1.20 gm.

Preparation.

Charta Potassii Nitratis.—Potassium Nitrate Paper. Potassium Nitrate, 200; distilled water, 800. Dissolve the Potassium Nitrate in the Distilled Water. Immerse strips of white, unsized paper in the solution, and dry them.]

Action of Potassium Nitrate.

External.—Nothing noteworthy.

Internal.—*Stomach and Intestines.*—It is liable to cause nausea, vomiting, diarrhœa, symptomatic of the gastritis and enteritis produced by it.

Blood.—Owing to its high diffusion power it quickly passes into the blood unchanged. External to the body, nitrates prevent the coagulation of the blood, or dissolve the clot if it be already formed; but it is not known that they have any effect on the blood in the body.

Heart.—Potassium nitrate is a powerful cardiac **depressant,**

causing the beats to become feeble and fewer. Large doses lead to great weakness, fainting, and death.

Kidneys.—Small doses are **diuretic** from their direct action on the renal cells, but large ones are liable to inflame the urinary passages, causing hæmaturia. The drug is excreted unchanged in the urine.

Skin.—Potassium nitrate is a mild **diaphoretic.**

THERAPEUTICS OF POTASSIUM NITRATE.

Internal.—*Blood.*—On account of its supposed action in preventing the coagulation of the living blood, it has been used in rheumatic fever and many inflammatory conditions, but it is now discarded. Probably, as it is a cardiac depressant, it only does harm.

Kidneys and Skin.—It is sometimes employed as a diuretic and diaphoretic in febrile conditions, but the acetate and the citrate are much preferable.

Asthma —For the treatment of this symptom, potassium nitrate paper, in pieces about 1½ inches [4 cm.] square, is lighted, one at a time, and the patient inhales the fumes. Ringer considers it better to dip the paper also into a solution of potassium chlorate, and to burn a piece large enough to fill a whole room with the fumes. This treatment often relieves.

10. **POTASSII CHLORAS.**—[Potassium Chlorate. $KClO_3$=122.28.

SOURCE.—Pass Chlorine into a mixture of Potassium Carbonate and slaked lime; then treat the result in boiling water and separate the chlorate by recrystallization. $K_2CO_3 + 6Ca(OH)_2 + 6Cl_2 = 2KClO_3 + 5CaCl_2 + CaCO_3 + 6H_2O$.

CHARACTERS.—Colorless, lustrous monoclinic prisms or plates, or a white powder, odorless and having a cooling, saline taste. Easily explodes on trituration with many substances, especially Sugar, Sulphur, Tannic Acid, Metallic Sulphides, Phosphorus, Charcoal, and Glycerin. *Solubility.*—In 16.7 parts of water; insoluble in absolute Alcohol.

IMPURITIES.—Calcium chloride and lime.

Dose, 3 to 20 gr.; .20 to 1.20 gm.]

Preparation.

Trochisci Potassii Chloratis.—[Troches of Potassium Chlorate.

potassium citrate and acetate is slight, and the urea and other solids of the urine are actually decreased, yet clinical experience points clearly to the fact that both these salts are, in chronic Bright's disease, **powerful diuretics.** They are frequently used in this disease and in feverish conditions, and also to increase the amount of urine, and thus to remove pathological fluids in cases of pleuritic effusion,

They render the [illegible] nd are much employed for this purpose, having [illegible] r other potassium salts that they do not derange [illegible] only do they prevent the precipitation of uric [illegible] nder the formation of **uric acid gravel**, but [illegible] e small uric acid calculi. Roberts states that [illegible] at the alkalinity necessary for this purpose, 40 [illegible] 4.00 gm.] of the acetate or citrate should be [illegible] unces [120. c.c.] of water, and taken every four [illegible] than this is used, harm is done; for an insoluble biurate forms on the surface of the calculus. Owing to the depressing action of potassium salts, they should be used with care in persons suffering from heart disease.

Skin.—Both these salts may be used in slight pyrexia, such as that of a common cold, on account of their diapnoretic properties.

Lungs.—These salts, like the carbonates and bicarbonates, are mild saline expectorants, especially suitable for cases of bronchitis, with viscid, scanty expectoration, as they increase the secretion and lessen the viscidity. The potassium iodide is, however, still more efficacious.

7. **POTASSII SULPHAS.**—[Potassium Sulphate. $K_2SO_4 = 173.88$.

SOURCE.—Add Potassium Carbonate to Acid Potassium Sulphate, which is a bye product of the manufacture of Nitric Acid. $2KHSO_4 + K_2CO_3 = 2K_2SO_4 + CO_2 + H_2O$.

CHARACTERS.—Hard, colorless, transparent, six-sided, rhombic prisms terminated by pyramids, or a white powder, odorless, and having a somewhat bitter, saline taste. *Solubility.*—In 9.5 parts of water; insoluble in Alcohol.

IMPURITIES.—Sodium, arsenic, lead, copper, zinc, iron, aluminum, calcium, magnesia and chlorides.

Dose, ½ to 4 dr.; 2. to 15. gm.

8. POTASSII BITARTRAS.—Potassium Bitartrate. $KH_4C_4HO_6$ — 187.67. *Synonyms.*—Acid Potassium Tartrate. Cream of Tartar.

SOURCE.—Obtained by purification from crude Tartar (argol) deposited on the sides of wine casks during the fermentation of grape juice, and purified by boiling with water, filtration through charcoal and crystallization.

CHARACTERS.—Colorless or slightly opaque rhombic crystals; or a fine, white, somewhat gritty powder, odorless, and having a pleasant, acidulous taste. *Solubility.*—In 201 parts of water; very sparingly soluble in Alcohol.

IMPURITIES.—Calcium tartrate, copper, lead, and iron.

Potassium Bitartrate is contained in Pulvis Jalapæ Compositus.]

Dose, 20 to 60 gr.; [1.20 to 4.00 gm.] (diuretic and refrigerant); ½ to 4 dr.; [2. to 15. gm.;] (purgative).

ACTION OF POTASSIUM BITARTRATE AND SULPHATE.

External.—One of these being only slightly acid and the other neutral, they have none of the external caustic or antacid properties of other potassium salts.

Internal.—*Intestines.*—Both salts are typical hydragogue **saline purges,** producing easy, soft, watery motions without griping. They abstract fluid from the blood, and cause it to be poured into the intestine. Their mode of action has already been fully described (*see* p. 89).

Liver.—Potassium **sulphate** is a moderate **cholagogue,** slightly increasing the biliary flow.

Kidney.—The **bitartrate** is **diuretic,** because a small amount of it is, in the intestine, converted into a carbonate and absorbed, and this acts directly on the renal cells. Hence it renders the **urine alkaline.** But all the sulphate and most of the bitartrate is excreted with the fæces, and if, as seems probable, some is absorbed by the small intestine in the form in which it is taken, it is excreted again into the colon.

THERAPEUTICS OF POTASSIUM BITARTRATE AND SULPHATE.

Internal.—*Intestines.*—These excellent purgatives are frequently used, especially for habitual sluggishness of the bowels. A dose should be dissolved in a tumbler of warm water, and sipped during dressing. They may be employed to open the

Preparation.

Liquor Sodæ.—[Solution of Soda. *Synonym.*—Solution of Sodium Hydrate.

SOURCE.—An aqueous solution of Sodium Carbonate is boiled with slaked Lime. The supernatant liquid is then siphoned off. $Na_2CO_3 + Ca(HO)_2 = 2NaHO + CaCO_3$. Or it may be prepared by dissolving Soda, 56; in distilled water, 944. The Soda must be of the full strength, as directed by the U. S. P. (90 per cent.).

CHARACTERS.—A clear, colorless liquid, odorless, having a very acrid and caustic taste and a strong, alkaline reaction. Sp. gr., 1.059. *Strength* about 5 per cent. of the Hydrate.

IMPURITIES.—Lime, sulphates, chlorides, and carbonates.

INCOMPATIBLES.—The same as of Liquor Potassæ.

Dose, 5 to 20 m.; .30 to 1.20 c.c., freely diluted.]

ACTION OF SODA.

It is in all respects save one similar in its action to potash. The difference is, that sodium salts are all much less depressant to the cardiac, muscular and nervous systems, and therefore far less poisonous than potassium salts.

THERAPEUTICS OF SODA.

It is very little used. Potash is almost always preferred.

TOXICOLOGY.

Poisoning by caustic alkalies is very rare; usually it takes place either by Potash, Soda, Pearlash (Potassium Carbonate), or soap lees (Sodium Carbonate). (Both the last are impure. They contain caustic Soda or Potash.)

Symptoms.—A caustic taste is experienced, and is quickly followed by symptoms of gastro-intestinal irritation, viz., burning heat in the throat, vomiting, diarrhœa, and abdominal pain, together with those of depression, viz., a feeble, quick pulse, and a cold clammy skin. Soon the lips, tongue and throat become swollen, soft and red. *Post-mortem appearances.*—The mucous membrane of the mouth, tongue, stomach and œsophagus, and occasionally that of the larynx, is excoriated, dark, softened and inflamed.

Treatment.—Wash out the stomach or give emetics, as Zinc Sulphate, 20 gr. [1.20 gm.]; or powdered Ipecacuanhæ, 30 gr. [2.00 gm.]; or Copper Sulphate, 5 gr. [.30 gm], in half a pint [240 c.c.] of tepid water; or Vinum Ipecacuanhæ, ℥j [30 c.c.]; or mustard, a tablespoonful [16 gm.] in

half a pint [240. c.c.] of water; or common salt, 2 tablespoonfuls [30. gm.] in half a pint [240. c.c.] of tepid water; or $\frac{1}{10}$ gr. [.006 gm.] of apomorphine [hydrochlorate] hypodermatically. If none of these are handy, give plenty of warm water and tickle the back of the throat. Then give feeble acids, as Vinegar, diluted Lemon juice, diluted solution of Citric Acid, diluted Acetic Acid. Then demulcents, as oil, flaxseed tea, or water and white of egg.

2. **SODII CARBONAS.**—[Sodium Carbonate, $Na_2CO_3 + 10H_2O = 285.45$. *Synonyms.*—Sal Soda. Washing Soda.

SOURCE.—Made thus:—First stage, Sodium Chloride and Sulphuric Acid are heated together. $2NaCl + H_2SO_4 = Na_2SO_4 + 2HCl$. Second stage the Sodium Sulphate is heated with Carbon. $Na_2SO_4 + 4C = Na_2S + 4CO$. Third stage, the Sodium Sulphide is heated with chalk. $Na_2S + CaCO_3 = Na_2CO_3 + CaS$.

It is also made from Cryolite, a mineral found in Greenland. Cryolite and chalk are heated to redness, producing Calcium Fluoride and Sodium Aluminate; the latter is soluble in water, and is decomposed by Carbon Dioxide, which precipitates Aluminum Hydroxide, retaining a little Sodium Carbonate, while the pure Sodium Carbonate remains in solution.

CHARACTERS.—Colorless, monoclinic crystals, odorless, and having a strongly alkaline taste. In dry air the salt effloresces, and if left exposed soon loses about one half of its water of crystallization and becomes a white powder. *Solubility.*—In 1.6 parts of water; insoluble in Alcohol and in Ether.

IMPURITIES.—Sulphates, chlorides and metals.

Sodium Carbonate is used to prepare Liquor Sodæ Chloratæ, Massa Ferri Carbonatis, and Suppositoria Glycerini.

Dose, 5 to 15 gr.; .30 to 1.00 gm.

Preparation.

Sodii Carbonas Exsiccatus.—Dried Sodium Carbonate.

SOURCE.—200 parts of Sodium Carbonate are broken into small fragments, allowed to effloresce, then gently heated until it becomes a white powder, weighing 100 parts.

CHARACTERS.—A loose, white powder, conforming to the tests and reactions given under Sodii Carbonas].

Dose, 5 to 15 gr., [.30 to 1.00 gm.]

ACTION AND THERAPEUTICS OF SODIUM CARBONATE AND THE DRIED CARBONATE.

The same as those of soda, except that the carbonate is less caustic.

3. **SODII BICARBONAS.**—[Sodium Bicarbonate. $NaHCO_3 = 83.85$. *Synonyms.*—Baking Soda. Sodium Sesquicarbonate. Soda.

SOURCE.—Made from the Carbonate in the same way as the Potassium Bicarbonate is made. $Na_2CO_3 + CO_2 + H_2O = 2NaHCO_3$. Or, by treating Sodium Chloride at the same time with Ammonia gas and Carbon Dioxide. $NaCl + NH_3 + CO_2 + H_2O = NaHCO_3 + NH_4Cl$.

CHARACTERS.—A white opaque powder, odorless, and having a cooling, mildly alkaline taste.

Solubility.—In 11.3 parts of water; insoluble in Alcohol and Ether.

IMPURITIES.—The carbonate.

INCOMPATIBLES.—It is decomposed by acids and acid salts, *e. g.*, Bismuth Subnitrate.

Sodium Bicarbonate is used to prepare Mistura Rhei et Sodæ, Ferri Carbonas Saccharatus, and Pulvis Effervescens Compositus.

Dose, 5 to 60 gr.; .30 to 4.00 gm.

Preparation.

Trochisci Sodii Bicarbonatis.—Troches of Sodium Bicarbonate. Sodium Bicarbonate, 20; Sugar, 60; Nutmeg, 1 gm.; Mucilage of Tragacanth, a sufficient quantity to make 100 troches. Triturate the Nutmeg with the Sugar, gradually added, until they are reduced to a fine powder, and mix this intimately with the Sodium Bicarbonate; then with the Mucilage of Tragacanth, form a mass. Each Troche contains 3 gr.; .20 gm., of Sodium Bicarbonate.]

Dose, 1 to 6 troches.

ACTION OF SODIUM BICARBONATE.

The same as that of potassium bicarbonate, except that it is much more **slowly absorbed** from the gastro-intestinal tract, and like all sodium salts it is only **feebly depressant.**

THERAPEUTICS OF SODIUM BICARBONATE.

External.—A lotion of 7 gr [.50 gm.] to 1 fl. oz. [30 c.c.] of water is employed as a sedative to relieve itching.

Internal.—*Stomach.*—Its use in disease is very similar to that of the corresponding salt of potassium, but on account of the two differences just mentioned it is much more frequently given. Hence it is a very common ingredient of medicines designed to relieve **dyspepsia,** being taken at or a little before meals to increase the flow of gastric juice, or some time afterwards to neutralize excessive acidity in the class of cases in

which the patient complains of heartburn and acid eructations. Its value is also partly due to its **sedative** action on the gastric nerves, whereby it relieves gastric pain, and partly also to its power of liquefying tenacious mucus. A very favorite gastric sedative mixture consists of about 10 gr.; [.60 gm.] of sodium bicarbonate, together with the same quantity of bismuth subcarbonate, suspended in mucilage. A grain or two; [.06 to .12 gm.] of sodium bicarbonate with a grain; [.06 gm.] of powdered rhubarb and some sugar, forms a common stomachic powder for children. Sodium bicarbonate and gentian are also often combined together in stomachic mixtures.

It is so slowly absorbed, and is, in comparison with potassium salts, so poor a solvent of uric acid, that it is rarely used for any effects it may have after absorption.

4. **SODII PHOSPHAS.**—[Sodium Phosphate. $Na_2HPO_4 + 12H_2O = 357.32$. *Synonym.*—Sodium Orthophosphate.

SOURCE.—Digest Bone Ash with Sulphuric Acid; Acid Calcium Phosphate is formed. $Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$. Filter and add Sodium Carbonate to the solution. $CaH_4(PO_4)_2 + Na_2CO_3 = Na_2HPO_4 + H_2O + CO_2 + CaHPO_4$. The filtrate requires to be evaporated and the salt is obtained by crystallization.

CHARACTERS.—Large, colorless, monoclinic prisms, odorless, and having a cooling saline taste. The crystals effloresce on exposure to the air, and gradually lose 5 molecules of their water of crystallization. *Solubility.*—In 5 parts of water.]

IMPURITY.—Lime phosphate, sulphates, and carbonates.

[*Sodium Phosphate is used to prepare* Ferri Phosphas Solubilis.

Dose, 5 gr. to 1 oz.; .30 to 30. gm.]

5. **SODII SULPHAS.**—Sodium Sulphate, $Na_2SO_4 + 10H_2O = 321.42$. *Synonym.*—Glauber's Salt.

SOURCE.—Neutralize with Sodium Carbonate, the residue left in the manfacture of Hydrochloric Acid from Salt. $2NaHSO_4 + Na_2CO_3 = 2Na_2SO_4 + CO_2 + H_2O$.

CHARACTERS.—Large, colorless, transparent, monoclinic prisms, [odorless and having a bitter, saline taste, efflorescing on exposure to air, and losing all of their water of crystallization.] *Solubility.*—In 3 parts of water.

IMPURITIES.—Ammonium and iron salts.

Dose, 1 to 8 dr. [4. to 30. gm.]

6. POTASSII ET SODII TARTRAS.—Potassium and Sodium Tartrate. [$KNaC_4H_4O_6 + 4H_2O = 258.51$. *Synonym.*—Rochelle Salt.

SOURCE.—Add Acid Potassium Tartrate to a hot solution of Sodium Carbonate. $2KHC_4H_4O_6 + Na_2CO_3 = 2KNaC_4H_4O_6 + H_2O + CO_2$.

CHARACTERS.—Colorless, transparent, rhombic prisms, or a white powder, odorless, and having a cooling, saline taste. The crystals are slightly efflorescent. *Solubility.*—In 2 parts of cold water.

IMPURITY.—Acid Potassium Tartrate.

Dose, ¼ to 1 oz.; 8. to 30. gm. (purgative), **30 to 60 gr.; 2. to 4. gm.** (diuretic).

Preparation.

Pulvis Effervescens Compositus.—Compound Effervescing Powder. *Synonym.*—Seidlitz Powder. Take Potassium and Sodium Tartrate, 93 gm., and Sodium Bicarbonate, 31 gm.; mix, divide into twelve equal parts, and wrap each part in a separate paper of some pronounced color, as blue. Tartaric Acid, 27 gm., divide into twelve equal parts, and wrap each part in a separate paper of a color distinctly different from that used for wrapping the mixture, as white.]

Dose. Dissolve the powder in the blue paper in nearly half a pint [240.c.c.] of cold or warm water, and then add that in the white paper, and drink while effervescing.

ACTION OF SODIUM SULPHATE AND PHOSPHATE, AND OF POTASSIUM AND SODIUM TARTRATE.

Internal.—*Intestines.*—Owing to the slowness with which, compared to the corresponding potassium salts, these sodium salts are absorbed, they pass on into the intestines and there act more efficiently than potassium salts. They are typical **saline purgatives,** abstracting fluid from the blood until they form a 5 per cent solution, and then exerting a painless laxative effect, produce a soft motion about two or three hours after administration (*see* p. 89). The sulphate, which is the most active purgative, and the phosphate are mild cholagogues.

Blood and Kidneys.—Owing to their tardy absorption the action of these salines, as alkalizers of the blood and urine and as diuretics, is more feeble than that of the corresponding potassium salts.

Therapeutics of Sodium Sulphate and Phosphate, and of Potassium and Sodium Tartrate.

Internal.—*Intestines.*—These salts of sodium are some of the best purgatives we possess, being especially useful for habitual constipation, and for constipation associated with gout, with hepatic dyspepsia, or with any of the manifestations of an excess of uric acid in the blood or the urine. The best way to take them is to dissolve the required amount in half a tumbler of lukewarm water, and to drink it in successive small draughts while dressing in the morning. The bowels are then usually comfortably opened soon after breakfast. These salts, especially the phosphate and sulphate, are also cholagogues; these two are therefore to be preferred in cases of disease of the liver. The sulphate is the most powerful purgative of all. It is the chief constituent of Carlsbad, Marienbad, Tarasp, Villacabras and [Rubinat] Condal waters, and it occurs associated with much magnesium sulphate in Æsculap, Hunyadi Janos, Seidlitz, Pullna, Friedrichshal, and Kissingen waters. A powder consisting of 30 gr. [2. gm.] of each of sodium sulphate and magnesium sulphate and a grain [.06 gm.] of sodium chloride and sodium bicarbonate (dose 1 to 4 dr.); [4.—15. gm.] forms when dissolved a good imitation of Æsculap, Hunyadi Janos, and Franz Joseph waters. The phosphate is a milder and less unpleasant purgative than the others; it is often given to children. The effervescing preparation [Seidlitz Powder] is a palatable form. If large doses are used, the evacuations are very watery, and therefore these drugs are useful to remove fluid in cases of dropsy or ascites (especially if due to disease of the liver.)

7. **SODII CHLORIDUM.**—Sodium Chloride. NaCl [= 58.37.]

Synonym.—Common Salt.

Source.—Occurs native.

Characters.—[Colorless, transparent, cubical crystals, or a white, crystalline powder, odorless, and having a purely saline taste. *Solubility.*—In 2.8 parts of water; almost insoluble in Alcohol.

Impurity.—Potassium chloride.]

Dose, 5 to 60 gr.; [.30 to 4.00 gm]

Action of Sodium Chloride.

Common salt forms an article of diet with all creatures living on vegetable food, especially if it contains large amounts of potassium, but is not used either by carnivorous animals or by tribes living solely on flesh. The importance of it is seen in the long distances herbivorous animals will wander to salt licks, and by the fact that tribes living on vegetables will go to war for the possession of it. Bunge's explanation of this desire for salt is as follows: Blood plasma contains much sodium chloride, vegetable foods contain a large amount of potassium salts; when, therefore, these salts of potassium reach the blood, potassium chloride and the sodium salt of the acid which was combined with the potassium are formed. This and the potassium chloride are excreted by the kidneys, and the blood loses its sodium chloride, which loss is therefore made up by taking sodium chloride with the food. The deprival of salt leads to general weakness, œdema and anæmia, a series of symptoms often seen in France before the repeal of the salt tax. Quantities of a tablespoonful [15. gm.] and upwards act as an emetic, and may also purge. Rectal injections of solutions of salt [by removing mucus may make the rectum unfit for the habitation of the *Oxyuris vermicularis*.]

Therapeutics of Sodium Chloride.

It is occasionally used as an emetic, also as an anthelmintic. Bathing in sea water acts as a mild general stimulant.

8. SODII SULPHIS.—[Sodium Sulphite. $Na_2SO_3+7H_2O=251.58$.

Source.—Saturate a solution of Sodium Carbonate or Caustic Soda with Sulphur Dioxide gas. $Na_2CO_3+SO_2=Na_2SO_3+CO_2$.

Characters.—Colorless, transparent, monoclinic prisms; odorless, and having a cooling, saline, sulphurous taste; efflorescent in air. *Solubility.*—In 4 parts of water.

Impurities.—Sulphates and chlorides]

Dose, 5 to 60 gr.; [.30 to 4.00 gm.]

9. SODII BISULPHIS.—[Sodium Bisulphite. $NaHSO_3=103.86$.

Source.—From Sodium Carbonate or Bicarbonate and Sulphur Dioxide gas. *Solubility.*—In 4 parts of water; and in 72 parts of Alcohol.

CHARACTERS.—Opaque, prismatic crystals, or a granular powder, exhaling an odor of Sulphur Dioxide, and having a disagreeable, sulphurous taste.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

10. **SODII HYPOSULPHIS.**—Sodium Hyposulphite. $Na_2S_2O + 5H_2O = 247.64$. *Synonym.*—Sodium Thiosulphate.

SOURCE.—From Sodium Bisulphite in solution with Metallic Zinc. $3NaHSO_3 + Zn = NaHSO_3 + Na_2SO_3 + ZnSO_2 + H_2O$, or pass Sulphurous Anhydride into a solution of Soda (or Sodium Carbonate) with Salt.

CHARACTERS.—Colorless, transparent, monoclinic prisms, odorless and having a cooling, afterwards bitter taste. *Solubility.*—In 0.65 part of water; insoluble in Alcohol.]

Dose, 5 to 20 gr.; [.30 to 1.20 gm.]

ACTION AND THERAPEUTICS OF SODIUM SULPHITE, BISULPHITE AND HYPOSULPHITE.

Sodium sulphite is, in the stomach, decomposed by the acids there, and gives off sulphurous anhydride. It may, therefore, be given to arrest fermentation. No other action of these salts is known. If any remains undecomposed, it is absorbed as a sulphite. They are very rarely given in medicine, but in sufficient doses might produce the effects of sodium sulphate.

11. **SODII BROMIDUM,** *see* Bromine.

12. **SODII IODIDUM,** *see* Iodine.

13. **SODII HYPOPHOSPHIS,** *see* Phosphorus.

14. **SODII ARSENAS,** *see* Arsenic.

15. **SODII SULPHOCARBOLAS,** *see* Acidum Carbolicum.

16. **SODII NITRAS.**—[Sodium Nitrate. $NaNO_3 = 84.89$.

SOURCE.—Imported from Chili and Peru.

CHARACTERS.—Colorless, transparent, rhombohedral crystals, odorless, having a cooling, saline and slightly bitter taste. Deliquescent in moist air. *Solubility.*—In 1.3 parts of water; soluble in 100 parts of Alcohol.

Dose, ½ to 1 oz.; 15. to 30. gm.

ACTION AND THERAPEUTICS OF SODIUM NITRATE.

Sodium nitrate, in moderate doses, does not directly lessen the force or frequency of the pulse, nor lower the animal temperature, nor increase the elimination of urea; the large doses acting

crystalline powder, odorless, and having a cooling saline ta
in warm dry air. *Solubility.*—In 1.4 parts of water; and in 30

IMPURITIES.—Silica, metals, and calcium.

Dose, 10 to 60 gr.; .60 to 4.00 gm.

USES.

Sodium acetate is diuretic, but it is rarely used
It is employed principally to prepare acetic acid
and other compounds.]

18. **SODII BENZOAS,** *see* Acidum Benzoicum.

19. **SODII NITRIS,** *see* Nitrites.

20. **SODII VALERIANAS,** *see* Valeriana.

21. **SODII SALICYLAS,** *see* Acidum Salicylicum.

22. **SODII BORAS,** *see* Acidum Boricum.

23. **SODII CHLORAS.**—[Sodium Chlorate. NaClO

SOURCE.—From Acid Sodium Tartrate and Potassium C
tion; by filtration, evaporation and crystallization. $NaHC_4$
$NaClO_3+KHC_4H_4O_6$.

CHARACTERS.—Colorless, transparent, crystals (principal
with tetrahedral facets), or a crystalline powder; odorless, h
saline taste. *Solubility.*—In 1.1 parts of water; and in 100 pa

Dose, 5 to 15 gr.; [.30 to 1.00 gm.]

USES.

Sodium chlorate has medicinal properties [illegible]

24. SODII PYROPHOSPHAS.—[Sodium Pyrophosphate. $Na_4P_2O_7 + 10H_2O = 445.24$.

SOURCE.—From heating Sodium Phosphate. $2Na_2HPO_4 + 12H_2O = Na_4P_2O_7 + 13H_2O$.

CHARACTERS.—Colorless, transparent, monoclinic prisms, or a crystalline powder, odorless, having a cooling, saline and feebly alkaline taste. *Solubility.*—In 12 parts of water; insoluble in Alcohol.

Sodium Pyrophosphate is used to make Ferri Pyrophosphas Solubilis.

Dose, ½ to 4 dr.; 2. to 15. gm.

USES.

Sodium pyrophosphate has the same therapeutical action as sodium phosphate, but its principal use is in pharmacy.]

III. AMMONIUM.

$NH_3 = 17.01$.

1. AQUA AMMONIÆ FORTIOR.—[Stronger Ammonia Water. 28 per cent. by weight of the gas ($NH_3 = 17.01$) dissolved in water.

SOURCE.—Generate Ammonia gas by heating Ammonium Chloride with Slaked Lime, and pass it into water. $2NH_4Cl + Ca(OH)_2 = 2NH_3 + 2H_2O + CaCl_2$.

CHARACTERS.—A colorless, transparent liquid, having an excessively pungent odor, and very acrid and alkaline taste and a strongly alkaline reaction.] Sp gr. 0.901.

IMPURITIES.—Ammonium chloride, sulphide and sulphate.

Dose, 3 to 6 m.; [.20 to .40 c.c.], well diluted.

Preparation.

[Spiritus Ammoniæ.—Spirit of Ammonia. Contains 10 per cent., by weight, of the gas dissolved in Alcohol.

Dose, 10 to 60 m.; .60 to 4.00 c.c.]

2. AQUA AMMONIÆ.—[Ammonia Water. (10 per cent. by weight of the gas ($NH_3 = 17.01$) dissolved in water).

SOURCE.—The same as for Aqua Ammoniæ Fortior.

CHARACTERS.—Like, but less pungent than, the strong solution. Sp. gr. 0.960.

Dose, 10 to 20 m.; .60 to 1.20 c.c., well diluted.

Preparations.

1. **Linimentum Ammoniæ.**—Ammonia Liniment. *Synonym.*

—Volatile Liniment. Ammonia Water, 350; Alcohol, 50; Cotton seed oil, 600.]

2. **Spiritus Ammoniæ Aromaticus,** *see* Ammonium Carbonate.

Action of Solutions of Ammonia.

External.—A solution of ammonia produces **rubefaction** with a sensation of heat, and, if strong, a sensation of pain and burning. If the vapor is confined, it causes vesication.

Internal.—*Nose.*—When inhaled, the vapor of ammonia is irritating to the nose and air passages, causing a pungent sensation and sneezing. The eyes and nose water. The **pulse** and **respiration** are reflexly **accelerated.** If very concentrated, it produces swelling and inflammation of the nose, glottis and respiratory tract.

Stomach.—Like other alkalies, given before meals, ammonia increases the flow of gastric juice; given after meals, it neutralizes it. It dilates the gastric vessels, and produces a feeling of warmth in the epigastrium. It reflexly stimulates the **heart and respiration.**

Blood.—Its action on the blood is not known; but it is supposed to diminish its local liability to clot in cases of thrombosis, and to dissolve [it if a clot has] already formed.

Heart.—Ammonia causes a rise of blood-pressure with an increased pulse rate, due probably to stimulation of the accelerator mechanism.

Respiration.—It increases greatly the frequency of **respiration,** probably from stimulation of the respiratory centre in the medulla.

Nervous system.—The brain is unaffected, and the nerves also, except for the tingling produced when a strong solution of ammonia is locally applied. The motor functions of spinal cord are greatly stimulated by large doses, hence the convulsions in animals poisoned by this drug.

Kidneys.—Ammonia and its salts are oxidized in the body, and the nitric acid, uric acid, and urea in the urine are increased, and thus the acidity of this fluid is slightly heightened.

THERAPEUTICS OF SOLUTIONS OF AMMONIA.

External.—The liniment is used as counter-irritant in numerous conditions, such as chronic joint disease, chronic rheumatism, etc., and is often rubbed on the chest in bronchitis. Ammonia is a very uncertain vesicant. Weak solutions of it are often applied to the bites of insects. Aqua ammoniæ is very valuable when held to the nose of any one who has fainted, for it almost instantly, reflexly produces its stimulating effect on the heart and respiration.

Internal.—Ammonia in some form may be given before meals as a gastric stimulant in dyspepsia. Sal volatile (*see* below) is often used for this purpose, and also for its general stimulating effect on the cardiac, respiratory and spinal systems, especially in sudden collapse from any cause. Ammonia has been injected subcutaneously in cases of snake-bite.

3. **AMMONII CARBONAS.**—[Ammonium Carbonate. NH_4HCO_3-$NH_4NH_2CO_2 = 156.77$. *Synonyms.*—Bakers' Ammonia. Hartshorn.

SOURCE.—A mixture of Ammonium Sulphate or Chloride and Calcium Carbonate is subjected to sublimation and resublimation. $4NH_4Cl + 2CaCO_3 = 2CaCl_2 + NH_4HCO_3.NH_4NH_2CO_2 + NH_3 + H_2O$.

CHARACTERS.—White, hard, translucent, striated masses, having a strongly ammoniacal odor without empyreuma, and a sharp, saline taste. On exposure to the air it loses both Ammonia and Carbon Dioxide, becoming opaque, and is finally converted into friable, porous lumps, or a white powder.] *Solubility.*—Slowly but completely in 5 parts of water.

IMPURITIES.—Sulphates and chlorides.

Dose, 2 to 15 gr.; [.12 to 1.00 gm.] (stimulant or expectorant).

Preparation.

Spiritus Ammoniæ Aromaticus.—[Aromatic Spirit of Ammonia. *Synonym.*—Sal Volatile. Ammonium Carbonate, 34; Ammonia Water, 90; Oil of Nutmeg, 1; Oil of Lemon, 10; Alcohol, 700; Oil of Lavender Flowers, 1; water to make 1000. Sp. gr. about 0.905.]

Aromatic Spirit of Ammonia is used in making Tinctura Guaiaci Ammoniata and Tinctura Valerianæ Ammoniata.

Dose, ½ to 2 fl. dr.; [2. to 8. c.c.]

ACTION AND THERAPEUTICS OF AMMONIUM CARBONATE.

The external and internal actions of the carbonate are the

drops, odorless and tasteless; permanent in the air. *Solubility.*—Almost insoluble in water; insoluble in Alcohol.

INCOMPATIBLES.—Acids and sulphates.]

Dose, 10 to 60 gr. [.60 to 4.00 gm.]

Preparations.

1. Pulvis Cretæ Compositus.—Compound Chalk Powder. Prepared Chalk, 30; [illegible] 10; powdered Sugar, 50.

Dose, 5 to 60 g[illegible]

2. Mistura [illegible] ture. Compound Chalk Powder, 200; Cinnamon W[illegible] wan[illegible] make 1000.

Dose, 2 to 4 [illegible] to [illegible] c.c.

3. Hydrarg[illegible] [illegible]e Hydrargyrum.

4. Trochis[illegible] of Chalk. Prepared Chalk, 25; Acacia, 7 gm.; [illegible] c.; Sugar, 40 gm.; water to make 100 troches. E[illegible] gr.; .25 gm.]

Dose, *ad libitum.*

2. CALCII CARBONAS PRÆCIPITATUS.—[Precipitated Calcium Carbonate. $CaCO_3$—99.76.

SOURCE.—From Calcium Chloride and Sodium Carbonate, drying the precipitate. $CaCl_2 + Na_2CO_3 = 2NaCl - CaCO_3$.

CHARACTER.—A fine, white powder, odorless and tasteless, permanent in the air. *Solubility.*—Nearly insoluble in water.

Precipitated Calcium Carbonate is used to prepare Pulvis Morphinæ Compositus and Syrupus Calcii Lactophosphatis.]

Dose, 5 to 60 gr.; [.30 to 4.00 gm.]

ACTION OF CALCIUM CARBONATE.

External.—It is mildly astringent and helps to dry moist surfaces.

Internals.—*Stomach and Intestines.*—Calcium carbonate is **antacid.** It is a mild but certain **astringent.** How it acts as an astringent is unknown. It is excreted unchanged in the fæces.

Kidneys.—Because certain mineral waters containing calcium bicarbonates and sulphates amongst other salts, have been used successfully in cases of urinary gravel and calculi, it has been asserted that these salts are diuretic, and solvent for uric acid, but it is more likely that the beneficial effects of these waters are due only to the large amount of water drunk; [at least,] there is no

proof that it is due to the salts. Such waters are those of Contrexéville, Vittel, [Clarendon, and Waukesha.]

Therapeutics of Calcium Carbonate.

External. — Prepared chalk forms an excellent dusting powder for moist eczema.

Internal. — *Alimentary canal.* — Because of its mechanical action it is a good tooth powder. Mistura cretæ and pulvis cretæ compositus, particularly the former, are very valuable for checking mild diarrhœa, especially in children.

Kidneys.—There is no doubt that persons passing gravel or urinary calculi, especially if composed of uric acid, are benefited by drinking the waters of Contrexéville and Vittel. They should be taken in quantities of 3 to 6 pints [1500 to 3000 c.c.] a day and between meals, to avoid the large amount of fluid causing indigestion. At Contrexéville the great bulk is drunk before breakfast.

3. CALX.—[Lime. CaO=55.87. *Synonym.*—Burned Lime.

Source.—Made by burning white marble, oyster shells, or the purest varieties of natural Calcium Carbonate, to expel Carbon Dioxide.

Characters.—Hard white or grayish-white masses, which in contact with air gradually attract moisture and Carbon Dioxide, and fall into a white powder (slaked lime); odorless; of a sharp, caustic taste. *Solubility.*—In 750 parts of water; insoluble in alcohol.

Preparations.

1. **Liquor Calcis.**—Solution of Lime. *Synonyms.*—Lime Water. Solution of Calcium Hydrate.

Source. — Made from slaked lime by solution. A saturated, aqueous solution of Calcium Hydrate. The percentage of Calcium Hydrate varies with the temperature, being somewhat over 0.17 per cent. at 59° F.; [15° C., and diminishing as the temperature rises.

Dose, 1 to 8 fl. dr.; 4. to 30. c.c.]

2. **[Linimentum Calcis.**—Lime Liniment. *Synonym.*—Carron Oil. Solution of Lime, Linseed Oil, of each, one volume. Mix them by agitation.

3. **Syrupus Calcis.**— Syrup of Lime. Lime, 60; sugar, 400; water, to 1000.

Dose, 15 to 60 m.; 1. to 4. c.c.

4. **Potassa cum Calce.**—*See* Potassium, p. 117].

Aqua Ammoniæ. It is not used externally, but Spiritus Ammoniæ Aromaticus is inhaled for its reflex effects, is given as a **gastric stimulant** and carminative in dyspepsia, as a **cardiac and general stimulant** in syncope, etc. It is, in addition, an excellent **expectorant**, stimulating the respiratory movements, and by its general stimulating effect on the capillaries. It is most used for children. It is an **emetic** acting

ace symptoms like other alka-
s are often inflamed, and the
from this cause.
S.

monium Chloride. NH_4Cl =

Neutralize Ammonia with Sulphuric Acid, converting all to Ammonium Sulphate. $2NH_3 + H_2SO_4 = (NH_4)_2SO_4 = NH_4)_2SO_4 - 2H_2O$. After crystallization with Sodium Chloride. $(NH_4)_2SO_4 - 2NaCl = 2NH_4Cl +$

A white crystalline powder, without odor, having a cool-
ing saline taste, permanent in the air, but volatile when heated. *Solu-*
ble in water, almost insoluble in Alcohol.

Dose, 5 to 30 grains, 30 to 2.00 gm.

Preparation.

Troches Ammonii Chloridi.—Troches of Ammonium Chloride.
Ammonium Chloride, 15; Extract of Glycyrrhiza, 25; Tragacanth, 12;
Sugar, 50 gm.; Syrup of Tolu a sufficient quantity to make 100 troches.
Each troche contains two grains, 12 gm.

Dose, 1 to 6 troches.

Action of Ammonium Chloride.

Locally applied Ammonium Chloride increases the secretion of mucous membranes, and to a slight extent it does the same after absorption. It is a feeble cholagogue, diaphoretic, and diuretic.

Therapeutics of Ammonium Chloride.

It is a very favorite remedy for local application, by means of inhalation of the vapor, to increase the secretion of mucus from the pharynx, Eustachian tubes, larynx, trachea and bronchi in cases of chronic pharyngitis, otitis media, laryngitis, and bronchitis. Many forms of apparatus for its inhalation are in the market. In most of them it is generated by the action of hydrochloric acid on ammonia. It is occasionally given by the mouth, either as a cholagogue, gastric stimulant, diaphoretic, diuretic, or expectorant, but it is too feeble to be recommended, and it is very [unpleasant]; the taste may to some extent be concealed by liquorice. Some authorities consider it to be, in large doses, a specific for neuralgia. It is not a general stimulant.

5. LIQUOR AMMONII ACETATIS.—[Solution of Ammonium Acetate. *Synonym.*—Spirit of Mindererus. An aqueous solution of Ammonium Acetate ($NH_4C_2H_3O_2 = 76.87$), containing about 7 per cent. of the Salt, together with small amounts of Acetic and Carbonic Acids.

Source.—Ammonium Carbonate is gradually added to diluted Acetic Acid until it is neutralized.

Incompatibles.—Potash, soda, and their carbonates, acids, lime-water, lead and silver salts.

Solution of Ammonium Acetate is used in preparing Liquor Ferri et Ammonii Acetatis.]

Dose, 2 to 8 fl. dr.; [8. to 30. c.c.]

Action and Therapeutics of Ammonium Acetate.

It is a mild **diaphoretic** and **diuretic**, and is used only for these effects. It probably acts in both cases, either on the secretory cells or the nerves connected with them. It does not irritate the kidneys, but increases both the water and the solids excreted. It is employed in Bright's disease as a diuretic, and in febrile conditions as a diaphoretic.

6. AMMONII BENZOAS, *see* Acidum Benzoicum.

7. AMMONII BROMIDUM, *see* Bromine.

[8. AMMONII IODIDUM, *see* Iodine.]

9. AMMONII NITRAS.—[Ammonium Nitrate. $NH_4NO_3 = 97.9$.

Source.—By treating commercial Ammonium Carbonate with Nitric

Acid, filtration and evaporation. $NH_4HCO_3NH_4NH_2CO_2 + 3HNO_3 = 3NH_4NO_3 + 2CO_2 + H_2O$.

CHARACTERS.—Colorless crystals, generally in the form of long, thin rhombic prisms, or in fused masses, without odor, having a sharp, bitter taste, and somewhat deliquescent. *Solubility.*—In 0.5 part of water; and in 20 parts of Alcohol.

Ammonium Nitrate is used to prepare nitrous oxide gas, freezing mixtures and artificial cold applications.]

10. **AMMONII VALERIANAS,** *see* Valeriana.

IV. LITHIUM.

Li=7.01.

1. **LITHII CARBONAS.**—[Lithium Carbonate. $Li_2CO_3 = 73.87$.

SOURCE.—By action of Lithium Chloride upon Ammonium Carbonate, filtration, washing with Alcohol, and drying. $2LiCl + NH_3HCO_3 = Li_2CO_3 + NH_4Cl + HCl$.

CHARACTERS.—A light, white powder, odorless, and having an alkaline taste; permanent in the air. *Solubility.*—In 80 parts of water; insoluble in Alcohol.

IMPURITIES.—Lime, and aluminum.

Dose, 2 to 10 gr.; .12 to .60 gm.

2. **LITHII CITRAS.**—Lithium Citrate. $Li_3C_6H_5O_7 = 209.57$.

SOURCE.—By action of Lithium Carbonate upon Citric Acid, evaporation and crystallization. $3Li_2CO_3 + 2H_3C_6H_5O_7 = 2Li_3C_6H_5O_7 + 3H_2O + 3CO_2$.

CHARACTERS.—A white powder, odorless and having a cooling, faintly alkaline taste; deliquescent on exposure to air. *Solubility.*—In 2 parts of water; almost insoluble in Alcohol or Ether.

Dose, 5 to 20 gr.; .30 to 1.20 gm.

3. **LITHII CITRAS EFFERVESCENS.**—Effervescent Lithium Citrate.

SOURCE.—Lithium Carbonate, 70; Sodium Bicarbonate, 280; Citric Acid, 370; Sugar, a sufficient quantity, to 1000. Triturate the Citric Acid with Sugar, and dry the mixture thoroughly. Then incorporate with it, by trituration, the Lithium Carbonate and Sodium Bicarbonate, and enough Sugar to make the product weigh 1000 parts.

CHARACTERS.—A white powder having a cooling, saline and sweetish taste. *Solubility.*—Completely in water with effervescence.

Dose, 10 to 45 gr.; .60 to 3.00 gm.]

ACTION.

These lithium salts closely resemble in their action the corresponding potassium salts, but, as very little lithium is sufficient to form a salt with uric acid, and lithium urate is very soluble, they are more powerful **solvents of uric acid.** They are also efficacious as **diuretics** and render the **urine** very **alkaline.** Large doses are general depressants like potassium salts.

THERAPEUTICS.

Lithium salts are much used internally in acute and chronic gout, to promote the elimination of sodium urate. They are also given as solvents to patients suffering from uric acid gravel and calculus. Those suffering from gravel often derive great benefit. A lotion of the carbonate (1 to 120 of water) applied on lint and covered with gutta percha relieves the pain of gouty inflammation, promotes the healing of gouty ulcers, and aids the disappearance of tophi [although it does seem to prevent their formation.] Lithium salts should always be freely diluted. The citrate has the advantage of greater solubility.

4. **LITHII BENZOAS.**—[*see* Acidium Benzoicum.

5. **LITHII BROMIDUM,** *see* Bromine.

6. **LITHII SALICYLAS,** *see* Acidum Salicylicum.]

GROUP III.

METALS OF THE ALKALINE EARTHS.

Calcium, Strontium, Barium, Magnesium, Cerium, Aluminium.

I. CALCIUM.

Ca = 39.91.

1. **CRETA PRÆPARATA.**—[Prepared Chalk. $CaCO_3 = 99.76$.

Synonym.—Drop Chalk.

SOURCE.—From Chalk by levigation, elutriation and drying.

CHARACTERS.—A white, amorphous powder, often moulded into conical

Dose, ⅛ to ½ gr.; [.008 to .03 gm.], (astringent), 2 to 20 gr.; [.12 to 1.20 gm.] (emetic).

Action of Salts of Copper.

External.—In the solid form this salt is, when applied to raw surfaces, a powerful **caustic**. In dilute solutions it is an **astringent**, acting like zinc sulphate, but more powerfully.

External.—*Alimentary canal.*—Here also, if very concentrated or given in large doses, copper salts are acute caustic irritants, but poisoning by them is very rare. In medicinal doses it is strongly **astringent.** Five to ten grains [.30 to .60 gm.] of the sulphate form a powerful **emetic,** acting directly on the stomach. As it is more irritating than zinc sulphate it acts more readily, but it has the disadvantage that, if it fails to act, the stomach must be promptly emptied by some other means, for if not the copper sulphate will cause inflammation of it.

Remote effects.—Copper salts are slowly absorbed, and copper is chiefly re-excreted by the liver in the bile. Nothing is known of its further effects.

Therapeutics of Salts of Copper.

External.—The sulphate is applied as a caustic to reduce exuberant granulations, and is used for tinea tarsi, being rubbed on the edges of the lids; as it is milder than nitrate of silver, it causes less pain. The Lapis Divinus, which is often used for this last purpose, consists of copper sulphate, potassium nitrate, [and alum of each] 24 parts, [and] camphor 1 part. The first three are fused together. The camphor is added, and the mass is cast into cylindrical moulds. Lotions of copper sulphate, usually about [1 to 240], may be applied as astringents for just the same purpose as lotions of zinc sulphate; but it must be remembered that they are more powerful. This is the usual strength for solutions which are to be dropped into the eye. Rather stronger solutions are mild hæmostatics.

Internal.—In small doses copper sulphate is valuable for severe diarrhœa; usually it is given by the mouth in the form of

2. **STRONTII BROMIDUM**, *see* Bromine.

3. **STRONTII IODIDUM**, *see* Iodine.]

III. BARIUM.

Ba. [= 136.9.

BARII DIOXIDUM.—Barium Dioxide. BaO_2=168.82. *Synonym.* Barium Peroxide.

SOURCE.—By conducting oxygen over Barium Oxide, heated to full redness.

CHARACTERS.—A heavy, grayish-white, or pale, yellowish-white, amorphous, coarse powder, odorless and tasteless. When exposed to the air it slowly attracts moisture and Carbon Dioxide, and is gradually decomposed. *Solubility.*—Almost insoluble in water.

IMPURITIES.—Sulphates and nitrates.

INCOMPATIBLES.—Hydrochloric, phosphoric and most other mineral acids.

Barium Dioxide is used in preparing Aqua Hydrogenii Dioxidi.]

ACTION OF BARIUM SALTS.

Barium chloride causes the cardiac contractions to become slower and more forcible, acting like Digitalis. The blood-vessels are **constricted**, and the blood-pressure rises. The plain muscular fibres of the intestine may be excited, and the peristalsis is increased. In these respects it resembles Ergot as well as Digitalis. It acts like Veratrine when applied locally to voluntary muscles, prolonging the contraction; but this effect is done away with by the application of Potassium Salts.

THERAPEUTICS OF BARIUM SALTS.

It is not often given, but the Chloride has been used for **mitral insufficiency** accompanied by irregularity of the heart, for **hæmorrhage**, and as a stimulant in **atony** of the **bladder** or **intestine.** Formerly it was given in nervous diseases. The Sulphide has been used as a depilatory.

TOXICOLOGY.

Poisonous doses cause salivation, thirst, vomiting, purging, difficulty of breathing, and, from its action on the spinal cord, paralysis of the limbs. The heart is arrested in systole.

nesium salts increase the alkalinity of the blood, alkalinize the urine, help to keep uric acid in solution, and are diuretic. But their action on the blood and urine is feebler than that of potassium and sodium salts, for they are with difficulty absorbed.

Therapeutics of Magnesium Salts.

Internal.—*Stomach.*—Magnesia and the carbonates are mild alkaline remedies, and may be used in the same class of cases as other alkalies. They form insoluble compounds with mineral acids, oxalic acid, and salts of mercury, arsenic and copper. By alkalizing the gastric contents they hinder the absorption of alkaloids. They are, therefore, antidotes to all these substances; the objection to them is their bulk. Magnesia is to be preferred, as the carbonate gives off carbon [dioxide] gas. They must be freely given. The sulphate is an antidote to lead and barium salts, forming insoluble sulphates.

Intestines.—The magnesium salts are very common purgatives. Magnesia, the carbonate, and the citrate are excellent for children. The sulphate is one of our best saline purgatives. It is very largely used, especially for the varieties of constipation that are associated with hepatic disorder, gout, or excessive uric acid. Its use is then spread over some time, and it may conveniently be taken as one of the mineral waters which contain it and sodium sulphate (*see* p. 133). A concentrated solution, causing as it does an increased secretion of intestinal fluid, is a useful purge for dropsy or ascites. [It is useful with glycerin in concentrated enema for thorough cleansing of the bowels before surgical operations (glycerin, 1 oz.; 30 c c., in a saturated solution of magnesium sulphate, in hot water 3 oz.; 90 c c., which is allowed to cool), it can also be used hypodermatically in dose of 3 gr.; .20 gm., which frequently will cause a watery evacuation.]

Blood and kidneys—So little of these salts is absorbed that they are only to be given for their alkaline effects on the blood and urine in those cases of gout and uric acid gravel in which potassium or sodium salts cannot be borne.

V. CERIUM.

Ce=139.9.

CERII OXALAS.—[Cerium Oxalate. $Ce_2(C_2O_4)_3-9H_2O=704.78$. *Synonym.*—Cerous Oxalate.

SOURCE.—The powdered mineral is heated with concentrated sulphuric acid, ignited, then dissolved in dilute nitric acid and treated with hydrogen sulphide to remove copper; the calcium salt is held in solution by a little hydrochloric acid, and the cerite metals are precipitated as oxalates by oxalic acid. It is purified by calcination and solution, reduction to a cerous salt and precipitated by oxalic acid.

CHARACTERS.—A white granular powder, without odor or taste. *Solubility.*—Insoluble in water, Alcohol or Ether.]

IMPURITIES.—Aluminum and oxalates.

Dose, 1 to 8 gr.; [.06 to .50 gm.]

THERAPEUTICS.

It is given empirically for vomiting, especially for that of pregnancy, and occasionally with benefit. No physiological action is known.

VI. ALUMINUM.

Al=27.04.

1. **ALUMEN.**—Alum. $Al_2K_2(SO_4)_4+24H_2O=946.46$. [*Synonyms.*—Aluminum and Potassium Sulphate. Potassium Alum.

SOURCE.—Made from Alum Slate or Shale (a mixture of Aluminum Silicate and Iron Sulphide) by roasting and exposing to the air. By lixiviating the heaps with water, Sulphuric Acid, Aluminum and Iron Sulphates are obtained in solution. This solution is concentrated, and while hot mixed with Potassium Chloride, which, reacting upon the Ferric Sulphate, yields Potassium Sulphate and Ferric Chloride, while the Alum separates on cooling as a crystalline powder. It is then purified by one or two recrystallizations. Also by making an Aluminum Sulphate from $Al(OH)_3$, the bye-product in the manufacture of Soda from cryolite.

CHARACTERS.—Large colorless octahedral crystals, sometimes modified by cubes, or in crystalline fragments, without odor, but having a sweetish and strongly astringent taste. On exposure to the air, the crystals are liable to absorb ammonia, and acquire a whitish coating.] *Solubility.*—In 9 parts of water.

INCOMPATIBLES.—Alkalies, lime, lead, mercury, and iron salts, tartrates and tannic acid.

IMPURITIES.—Ferrous sulphate and silicates.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

2. FERRUM REDUCTUM.—Reduced Iron. *Synonyms.*—Quevenne's Iron. [Iron by Hydrogen.] Metallic Iron with a variable amount of oxide.

SOURCE.—[Hydrogen gas is passed through a hot closed tube which contains freshly prepared Ferric Oxide which has been thoroughly washed. $Fe_2O_3+3H_2=Fe_2+3H_2O$.

CHARACTERS.—A very fine grayish-black, lustreless] powder, strongly attracted by the magnet, without odor or taste. *Solubility.*—Insoluble in water or Alcohol.

IMPURITY.—Sulphur.

Reduced Iron is used to make Pilulæ Ferri Iodidi and Ferri Iodidum Saccharatum.

Dose 1 to 5 gr.; [.06 to .30 gm.]

The following (viz., the sulphate, the carbonate, [the iodide and the lactate)] *are ferrous salts*, that is to say, salts of the lower Oxide, FeO.

3. FERRI SULPHAS.—[Ferrous Sulphate. $FeSO_4+7H_2O=277.42$. *Synonyms.*—If impure, Copperas. Green Vitriol.

SOURCE.—Iron Wire is dissolved by boiling in Sulphuric Acid and water. The sulphate is crystallized out. $Fe_2+2H_2SO_4=2FeSO_4+2H_2$.

CHARACTERS.—Large, pale, bluish-green monoclinic prisms, having a saline], styptic taste. *Solubility.*—In 1.8 parts of water; insoluble in Alcohol.

IMPURITIES.—Ferric salts and copper.

Ferrous Sulphate is used to make Ferri Carbonas Saccharatus, Liquor Ferri Subsulphatis, Liquor Ferri Tersulphatis, and Massa Ferri Carbonatis.

Dose, ½ to 2 gr.; [.03 to .12 gm.]

Preparations.

1. Ferri Sulphas Exsiccatus.—[Dried Ferrous Sulphate. Approximately $2FeSO_4+H_2O=357.28$.

SOURCE.—Heat the sulphate, 100 to 104° F.; 37.7 to 40° C., until it weighs 64 to 65 parts.

CHARACTERS.—A grayish-white powder, slowly but completely soluble in water.]

Dose, ½ to 2 gr.; [.03 to .12 gm.]

Dried Ferrous Sulphate is used to make Pilulæ Aloes et Ferri.

2. Ferri Sulphas Granulatus.—[Granulated Ferrous Sulphate. $FeSO_4+7H_2O=277.42$.

SOURCE.—Dissolve Ferrous Sulphate, 100; in diluted Sulphuric Acid, 5; and Distilled Water, 100; pour upon it Alcohol, 25; and filter, wash and dry the precipitate.

CHARACTERS.—Pale, bluish-green, crystalline powder, which conforms to the reactions of the sulphate.]

Therapeutics of Alum.

External.—It is occasionally used as a caustic to destroy weak exuberant granulations. Because of its astringency it has many uses; it may, for example, be applied to weeping eczematous surfaces, and as an injection or on [moistened] lint for vulvitis of children. Solutions of it have been used for leucorrhœa and gleet. Ten grains [; .60 gm.] to the fluid ounce; [30. c.c.] of water is a common strength for most purposes. Five grains [; .30 gm.] to the fluid ounce; [30 c.c.] make a good eye wash or a gargle. Strong solutions, or powdered alum, applied locally, stop bleeding, if it is not severe, such as occurs from piles, leech bites, slight cuts, the gums and the nose.

Internal.—*Alimentary canal.*—As a mouth wash or gargle [1–2 to 100], alum is very valuable in ulcerative stomatitis, in aphthous conditions of the mouth, and in slight pharyngitis or tonsilitis. One part of alum with five parts of glycerin, painted on with a camel's hair brush, is excellent for these conditions. If the nose be irrigated with a solution of alum, it may remedy a chronic ozæna. It has been found that other astringents are preferable for bleeding from the stomach and for diarrhœa, but a teaspoonful, [4. gm.] of alum, dissolved in simple syrup, and given every quarter of an hour till vomiting is produced, is an excellent emetic for children, and may be used to produce vomiting in laryngitis and bronchitis, as it is non-depressant. It is a strange fact that in lead colic, alum will sometimes open the bowels, probably because, being a sulphate, it precipitates any lead salt as an insoluble lead sulphate.

CHARACTERS.—A transparent, pale-green liquid, odorless, having a sweet, strongly ferruginous taste and a neutral reaction. Sp. gr. about 1.353.

Dose, 5 to 30 m ; .30 to 2.00 c.c.]

8. PILULÆ FERRI IODIDI.—[Pills of Ferrous Iodide. Triturate reduced Iron 4, with Iodine 5, and water; add Glycyrrhiza 1, Sugar 4, Extract of Glycyrrhiza 1, and Acacia 1 gm., with sufficient water, Balsam of Tolu and Ether, and evaporate to make 100 pills.] To be preserved from light and air as much as possible, as they do not keep well.

Dose, 1 to 2 pills.

9. FERRI LACTAS.—[Ferrous Lactate. $Fe(C_3H_5O_3)_2 + 3H_2O =$ 287.34.

SOURCE.—By crystallization from a solution of Lactic Acid and Iron in distilled water.

CHARACTERS.—Pale, greenish-white crusts, consisting of small, needle-shaped crystals, having a slight, peculiar odor, and a mild, sweetish ferruginous taste. *Solubility.*—In 40 parts of water, and almost insoluble in Alcohol.

Ferrous Lactate is used in Syrupus Hypophosphitum cum Ferro.

Dose, 1 to 5 gr.; .06 to .30 gm.]

The following (viz., the Chloride, the Tersulphate, the Nitrate, the Subsulphate, the Citrate, the Acetate, the Hydrate, [the Ammonium Sulphate, the Hypophosphite and the Valerianate]) *are Ferric Salts;* they are compounds of the higher Oxide, Fe_2O_3. Most are official in the form of liquors.

10. [FERRI CHLORIDUM.—Ferric Chloride. $Fe_2Cl_6 + 12H_2O =$ 539.5.

SOURCE.—Iron Wire, 15; Hydrochloric Acid, and distilled water to 60. By solution in water with heat, filtration, addition of Nitric Acid, and crystallization.

CHARACTERS.—Orange-yellow, crystalline pieces, very deliquescent, having a faint odor of Hydrochloric Acid and strongly styptic taste. *Solubility.* Freely in water, Alcohol and Ether.]

11. LIQUOR FERRI CHLORIDI.—[Solution of Ferric Chloride. An aqueous solution of Ferric Chloride ($Fe_2Cl_2 = 323.98$), containing about 37.8 per cent. of the Anhydrous Salt, or corresponding to about 13 per cent. of Metallic Iron.

SOURCE.—Dissolve Iron Wire, 15.8, in Hydrochloric Acid, 870, and water to 1000. $Fe + 2HCl = FeCl_2 + H_2$. Nitric Acid is also added, and thus the Ferrous is converted into Ferric Chloride. $6FeCl_2 + 6HCl + 2HNO_3 = 3Fe_2Cl_6 + 4H_2O + 2NO$.

CHARACTERS.—A reddish-brown liquid, having a faint odor of Hydrochloric Acid, and an acid, strongly styptic taste. Sp. gr. about 1.387.]

IMPURITIES.—Ferrous salts.

Dose, 2 to 10 m.; [.12 to .60 c.c.]

INCOMPATIBLES.—Hard water, mineral acids and salts, alkalies, lime water, potassium iodide, vegetable astringents, preparations of opium, and albuminous liquids.]

IMPURITY.—Lead carbonate.

Dose, ½ to 5 gr.; [.03 to .30 gm.]

Preparations made from the Acetate in which Lead exists as the **SUBACETATE**, $Pb_2O(C_2H_3O_2)_2$.

[1. **Liquor Plumbi Subacetatis.**—Solution of Lead Subacetate. *Synonym.*—Goulard's Extract. Lead Acetate, 170; and Lead Oxide, 100; are boiled together in distilled water, to make 1000.] An aqueous liquid containing in solution about 25 per cent. of Lead Subacetate [approximately $Pb_2O(C_2H_3O_2)_2 = 546.48$.

2. **Liquor Plumbi Subacetatis Dilutus.**—Diluted Solution of Lead Subacetate. *Synonym.*—Lead Water. Liquor Plumbi Subacetatis, 30; distilled water to 1000.

3. **Ceratum Plumbi Subacetatis.**—Cerate of Lead Subacetate. *Synonym.*—Goulard's Cerate. Solution of Lead Subacetate, 200; Camphor Cerate, 800.]

3. **PLUMBI CARBONAS.**—[Lead Carbonate. A mixture of Carbonate and Hydrate. $(PbCO_3), Pb(OH)_2 = 772.82$. *Synonym.*—White Lead.

SOURCE.—Expose Lead to the vapor of Acetic Acid and to air charged with Carbon Dioxide. $6Pb + 6HC_2H_3O_2 + 3O_2 + 2CO_2 = (PbCO_3), Pb(OH)_2 + 2H_2O + 2Pb(C_2H_3O_2)_2$.

CHARACTERS.—A heavy, white, opaque powder, or a pulverulent mass, without odor or taste.)

IMPURITY.—Lime.

Preparation.

Unguentum Plumbi Carbonatis.—Ointment of Lead Carbonate. Lead Carbonate, 10; Benzoinated Lard, 90.]

4. **PLUMBI NITRAS.**—[Lead Nitrate. $Pb(NO_3)_2 = 330.18$.]

SOURCE.—Dissolve Lead in warm diluted Nitric Acid.

CHARACTERS.—[Colorless, transparent, octahedral crystals, or white opaque crystals; without odor, and having a sweetish, astringent, afterwards metallic taste.]

5. **PLUMBI IODIDUM.**—[Lead Iodide. $PbI_2 = 430.46$.

SOURCE.—Mix solutions of Lead Nitrate and Potassium Iodide and dry the precipitate. $Pb(NO_3)_2 + 2KI = 2KNO_3 + PbI_2$.

CHARACTERS.—A heavy, bright-yellow powder, without odor or taste. *Solubility.*—In about 2000 parts of water.]

LIQUOR FERRI CITRATIS.—[Solution of Ferric Citrate.

aqueous solution of Ferric Citrate, corresponding to about 7.5 per
ferric Iron.

SOURCE.—From Solution of Ferric Sulphate, 1050; in water; precipita-
Ammonia Water, 880; with addition of Citric Acid, 300; filtration
solution of Citrate to 1000.

CHARACTERS.—A dark brown liquid, odorless, having a slightly ferru-
and an Sp. gr. 1.250.

Dose, 5 to 15 [illegible]

10. LIQUOR [illegible]S.—[Solution of Ferric Acetate.
[illegible] of Ferric Acetate.

SOURCE.—Ferri [illegible]cipitated with a solution of Am-
monia Water, 880. $Fe_2(OH)_6 + 3(NH_4)_2SO_4$. The
resulting hydrate is [illegible]etic Acid, 260. $Fe_2(OH)_6 +$
$6HC_2H_3O_2 = Fe_2(C_2$

CHARACTERS.— clear liquid of an acetous odor,
a sweetish, acidulous, Sp. gr. about 1.160.

Dose, 2 to 10 m

17. FERRI O[illegible]UM.—[Ferric Hydrate. *Synonyms.*—Hydrated Ferric Oxide. Ferric Hydroxide. $Fe_2(OH_6) = 213.52$.

SOURCE.—Add to a solution of Ferric Sulphate, 100; Ammonia Water, 110. The precipitate is Ferric Hydrate.

CHARACTERS.—A reddish-brown magma, wholly soluble in Hydrochloric Acid without Effervescence.

Dose, 1 to 4 dr.; 4. to 15. c.c.]

Preparations.

1. **Emplastrum Ferri.**—[Iron Plaster. *Synonym.*—Strengthening Plaster. Ferric Hydrate, 90; Burgundy Pitch, 140; Lead plaster, 720; Olive Oil, 50.]

2. **Trochisci Ferri.**—[Troches of Iron. Ferric Hydrate, 30; Vanilla, 1; Sugar, 100 gm.; Mucilage of Tragacanth, to make 100 troches.

Dose, 1 to 2 troches.]

18. **FERRI OXIDUM HYDRATUM CUM MAGNESIA.**—Ferric Hydrate with Magnesia. [*Synonym.*—Arsenic Antidote. Solution of Ferric Hydrate, 50; add to the Iron, water, 100. Magnesia, 10; add water to the Magnesia to 750. Keep in separate bottles.

USES. For arsenical poisoning, for which it should be mixed by adding the magnesia mixture gradually to the iron solution, and shaking until a homogeneous mass results. It should be given in large doses and frequently repeated.]

[.30 gm.] of extract of opium with 1 oz. [30. c.c.] of Liquor Plumbi Subacetatis Dilutus and 1 oz. [30. c.c.] of water.

Internal.—The chief uses of lead salts (the acetate is the only one given internally) are as astringents in severe diarrhœa, such as that of typhoid fever, and as hæmostatics, as in gastric ulcer, or in hæmorrhage from the intestine, especially if severe, as in typhoid fever or tuberculosis. For these purposes the Pilula Plumbi cum Opio [B. P.], (lead acetate, 3 gr.; [.20 gm.]; opium, 1 gr.; [.06 gm.]) is very valuable, and suppositories containing the same amount of the ingredients may be employed for rectal hæmorrhage. Lead salts produce marked constipation. Other preparations are generally preferred, but lead subacetate may be used as a gargle when an astringent effect on the mouth or pharynx is desired.

TOXICOLOGY.

ACUTE LEAD POISONING.—As when applied externally, so when taken internally, the Salts of Lead, if concentrated, are powerful irritants. Cases of acute poisoning are rare. The Acetate is most frequently taken. There is a burning, sweetish taste in the mouth, thirst, vomiting, abdominal colic, and usually constipation, but if the bowels are open the fæces are black: the skin is cold, and there is collapse. If the patient live long enough, cramps in the legs, giddiness, torpor, coma, and convulsions are present. *Post-mortem.*—The stomach and intestines show signs of irritant poisoning.

Treatment.—Give emetics (*see* p. 128), or wash out the stomach. Give Sodium or Magnesium Sulphate to form an insoluble sulphate, and to open the bowels. If collapse is present, stimulants and warmth should be used.

CHRONIC LEAD POISONING.—This is so common that it is fully described in text-books on medicine. It usually occurs to those who work in lead, because they will not wash their hands before meals, and thus they impregnate their food. Those who work at white-lead factories are very liable to it. It has also occurred in many ways from the impregnation of food and water with lead, especially from the storage of soft water in leaden cisterns and pipes.

Symptoms.—The earliest are constipation and intestinal colic. Lead is certainly absorbed, for it circulates in the blood and is excreted, chiefly by the kidneys. It is supposed to be taken up as an albuminate, but it cannot exist in the blood as such, for it would be precipitated by the alkali of that fluid. After absorption it diminishes the amount of hæmoglobin and the number of red blood-corpuscles, and produces a sallow anæmia; it checks the separation of urates from the blood and their excretion by the kidneys, hence gout is very common

24. FERRI ET AMMONII CITRAS.—[Iron and Ammonium Citrate. *Synonym.*—Ammonio-Ferric Citrate.

SOURCE.—From evaporation of a solution of Ferric Citrate, 100; with Ammonia Water, 40; to consistency of syrup. Dry the precipitate on glass.

CHARACTERS.—Thin, transparent, garnet-red scales, having a saline, mildly ferruginous taste, deliquescent. *Solubility.*—Very soluble in water; insoluble in Alcohol.]

IMPURITIES.—Alk

Dose, 1 to 5 gr.;

[Vinum F of Ferric Citrate. Iron and Ammonium Citrate, t Orange Peel, 150; Syrup, 100; White Wine, to

Dose, 1 to .

25. FERRI ET CITRAS.—Iron and Strychnine Citrate.

SOURCE.—Dissolve Iron and Ammonia Citrate, 98; in distilled water, 100; and Strychnine, 1; Citric Acid, 1; in distilled water, 20. Mix the solutions, evaporate to the consistency of syrup, and spread on plates of glass.

CHARACTERS.—Thin, transparent, garnet-red to yellowish-brown scales, having a bitter, slightly ferruginous taste. *Solubility.*—Completely in water.

Dose, 1 to 3 gr.; .06 to .20 gm.

26. FERRI ET AMMONII TARTRAS.—Iron and Ammonium Tartrate. *Synonym.*—Ammonio-Ferric Tartrate.

SOURCE.—Add solution of Ferric Sulphate, 100; to Ammonia Water, 110; diluted with cold water, 250; filter, dissolve the precipitate in Tartaric Acid, 89; dissolved in distilled water; filter and evaporate to a syrupy consistence and dry on glass.

CHARACTERS.—Thin, transparent scales, from garnet-red to reddish-brown, having a sweetish, slightly ferruginous taste. *Solubility.*—Very soluble in water; insoluble in Alcohol.

Dose, 5 to 15 gr.; .30 to 1.00 gm.

27. FERRI CITRAS.—Ferric Citrate.

SOURCE.—By evaporation of the Solution of Ferric Citrate to a syrupy consistency and drying on glass.

CHARACTERS.—Thin, transparent, garnet-red scales, odorless, having a slightly ferruginous taste, and an acid reaction. *Solubility.*—Completely in water; insoluble in Alcohol.

Dose, 1 to 5 gr.; .06 to .30 gm]

Preparations.

[1. **Argenti Nitras Dilutus.**—Diluted Nitrate of Silver. *Synonym.*—Mitigated caustic.

SOURCE.—It is a mixture made by fusing together Silver Nitrate, 30, and Potassium Nitrate, 60. The product is poured into moulds.

CHARACTERS.—A white, hard solid, generally in the form of pencils or cones of a finely granular fracture, becoming gray or grayish-black on exposure to light in the presence of organic matter; odorless, having a caustic, metallic taste, and neutral to litmus paper.

1. **Argenti Nitras Fusus.**—Moulded Nitrate of Silver. *Synonym.*—Lunar caustic.

SOURCE.—By melting Silver Nitrate, 100; Hydrochloric Acid, 4; cooling in moulds.

CHARACTERS.—A white, hard solid, generally in the form of pencils of a fibrous fracture, becoming gray or grayish-black on exposure to light.]

2. **ARGENTI OXIDUM.**—[Silver Oxide. Ag_2O=231.28.

SOURCE.—Shake a solution of Silver Nitrate with a solution of Potassa and wash the precipitate. $2AgNO_3+2KOH=Ag_2O+KNO_3+H_2O$.

CHARACTERS.—A heavy, dark brownish-black powder, having a metallic taste. *Solubility.*—Slightly in water.]

INCOMPATIBLES.—Chlorides and organic substances, especially creosote, for it rapidly oxidizes them and forms explosive compounds.

IMPURITY.—Metallic silver.

Dose, ½ to 2 gr.; [.03 to .12 gm.] in a pill.

3. **ARGENTI CYANIDUM.**—[Silver Cyanide. AgCN=133.64.

SOURCE.—From Potassium Cyanide, which reacts with Silver Nitrate, producing the precipitate of Silver Cyanide. $KCN+AgNO_3=AgCN+KNO_3$.

CHARACTERS.—A white powder, odorless and tasteless, permanent in dry air, but gradually turning brown on exposure to light. *Solubility.*—Insoluble in water and Alcohol.

Silver Cyanide is used to prepare extemporaneously Acidum Hydrocyanicum Dilutum.

4. **ARGENTI IODIDUM.**—Silver Iodide. AgI=234.19.

SOURCE.—From Silver Nitrate and Potassium Iodide, washing and drying the precipitate. $AgNO_3+KI=AgI+KNO_3$.

CHARACTERS.—A heavy, amorphous, light-yellowish powder, without odor and taste. *Solubility.*—Insoluble in water and Alcohol.

Dose, ¼ to 1 gr.; .015 to .06 gm.]

Alkalies and their Carbonates, Lime Water, Calcium Carbonate, Magnesia and Magnesium Carbonate give green precipitates with Ferrous, and brown with Ferric Salts.

Action of Iron and its Salts.

External.—They have no action on the unbroken skin, but when applied locally to the abraded skin, sores, ulcers, and mucous membranes, many of the iron salts, especially the **ferric salts,** are powerful **astringents,** because they **coagulate albuminous fluids**, both those discharged from the surface and also those in the tissue itself. There is no direct effect on the walls of the vessels, but the contraction of the coagulated albumin compresses them and diminishes their calibre. Partly for this reason, but still more because these salts of iron quickly cause the coagulation of blood, and the clot thus formed plugs the bleeding vessels, they are the most perfect **local hæmostatics** we possess, and will often arrest very severe hæmorrhage. Ferric chloride, the nitrate, and ferrous sulphate are all very strongly astringent; but the scale preparations, reduced iron, ferrous carbonate, ferric hydrate, ferrous iodide, ferric phosphate and ferric acetate are so very feebly astringent that they are never used as local applications; in fact, to most persons they are non-astringent. Ferric oxides have the property of converting oxygen into ozone, and are therefore disinfectant.

Internal.—*Mouth.*—Preparations of iron have a styptic taste, the **teeth** and **tongue** may be **blackened** when they are taken, owing to the formation of ferrous sulphide, the sulphur being derived from the food and the tartar on the teeth; hence it is advisable to take iron preparations through a glass tube [and immediately afterwards to brush the teeth. The free acid in the tincture of ferric chloride will destroy the enamel of the teeth, even if diluted with eight parts of water.] The astringent preparations have, when locally applied, the same action on the mucous membrane of the mouth as on the raw skin.

Stomach.—Whatever form of iron is given by the mouth, it is converted in the stomach into **ferric chloride,** with probably a little ferrous chloride. Long experience has shown that ferric

chloride is to the physician a most valuable preparation of iron; probably this is because it will not abstract hydrochloric acid from the gastric juice, as is the case with all other preparations of iron. It is often stated that an iron albuminate is formed in the stomach; this is incorrect, and when the iron albuminate is given by the mouth it will be converted into a chloride in the stomach. Although whatever form of iron is administered ferric chloride is formed in the stomach, the choice of the preparation is a matter of great importance, for if strongly acid salts are given, the acid set free after the formation of the chloride will act as a caustic, and damage the mucous membrane; even the preparations of the chloride may do this, for they often contain a considerable amount of free acid. These facts explain why iron preparations, especially the acid ones, so often cause headache, nausea, loss of appetite, and other symptoms of severe indigestion. We also learn why experience has taught that the sulphate, which is so often used, should be given in the form of a pill, for this, if specially coated, is not dissolved till the intestine is reached, and the acid is harmless in the alkaline solutions of that part of the alimentary canal. Further, we see why the preparations which are either not acid at all or only very slightly acid, such as reduced iron, ferric hydrate, ferrous carbonate and the scale preparations, do not as a rule cause indigestion [but it can also be said that they are generally not so efficient as the stronger preparations. However, this free acid may be neutralized by the addition of sodium bicarbonate, so that the tincture of ferric chloride will be acid only so far as the basic ferric chloride has an acid reaction; nor does this neutralization impair its therapeutic properties, for hydrochloric acid is added to it in the stomach. An effective preparation is now made, in which these disadvantages of the tincture of ferric chloride are removed, which is known as Weld's syrup of ferric chloride] Ferric chloride is very astringent, hence the astringent effect on the stomach of iron salts. The non-astringent preparations can only be astringent in proportion to the amount of ferric chloride formed from the gastric juice; but if large quantities of astrin-

gent preparations are given, the excess which is not decomposed by the gastric juice will add its astringency to that of the ferric chloride formed in the stomach.

Intestines.—On passing into the intestines, the contents of which are alkaline from sodium carbonate, ferric chloride becomes ferric oxide, which remains in solution owing to the presence of organic substances; ferrous chloride is converted into ferrous carbonate, which is also soluble. Lower down in the intestine, by the action of the sulphur compounds, the nascent hydrogen, and other readily oxidizable products of decomposition there present, these compounds of iron are converted into the sulphide and tannate (the tannic acid being derived from the vegetables in the food), and as such are eliminated with the fæces, which are turned black. Large amounts of the astringent preparations have a **constipating effect**; this may be owing to there being an excess of them, for the oxides and carbonates are non-astringent preparations.

Absorption—It was for a long time believed that iron, given as a drug, was absorbed as an alkaline albuminate and as a chloride, but this is almost certainly erroneous. There is no proof that iron, when administered as any of the iron preparations used in medicine, is absorbed at all. Thus a dog was fed on a meat diet; the amount of iron excreted in the urine was on the average [.056 gr.]; .0036 gm. a day. Then for nine days [.75 gr.]; .049 gm. of ferrous sulphate were given daily; for the first five subsequent days the excretion of iron in the urine did not increase, for the next six it increased by only [$\frac{1}{32}$ gr.] .002 gm. a day, afterwards it returned to the normal amount; so that with an increase of [over 7 gr.]; .441 gm. of iron ingested, only [$\frac{3}{16}$ gr.]; .012 gm. more than usual appeared in the urine. It is very likely that this slight excess in excretion may have been due to the fact that the large amount of iron taken corroded the intestinal epithelium, which therefore allowed a little iron to be absorbed. This experiment appears to show that no appreciable amount of iron, given as a drug, is absorbed, but it is possible that it may have been locked up in the body, or

eliminated by some other channel than the urine; and of these suppositions, the most likely is, that it was excreted from the blood into the intestine. It is often stated that the excretion of iron into the intestine takes place by the bile, but the most recent observations of Bunge and Hamburger show that the bile contains the merest traces of iron. In favor of iron being excreted into the intestines by the intestinal and gastric juices is the fact that the fæces of a fasting dog contain iron, but it is very little, and it must be remembered that the epithelium of the intestine, which is constantly being shed, normally contains iron. There is little doubt but that iron salts injected into the blood are excreted into the intestine, but this injection causes symptoms of poisoning, such as reduced blood-pressure, gastro-intestinal irritation, and paralysis of the muscles, due to depression of the central nervous system. But as these symptoms never follow the administration of large amounts of iron salts by the mouth, it would appear that they are not absorbed, and this confirms the experiment already described. On the whole, therefore, although the question is not definitely settled, the balance of evidence is that iron salts given as drugs are not absorbed from the intestine.

Blood.—It is often stated that the administration of iron causes, in healthy subjects, an increase in the number of red blood-corpuscles, but this is very doubtful. Probably in health it has little or no effect on the blood.

In certain forms of anæmia (a condition in which the amount of hæmoglobin and the number of corpuscles are diminished), especially in chlorosis, the administration of iron rapidly improves the blood in both respects. It is therefore said to be **hæmatinic**; and as an improvement in the quality of the blood leads to an improvement in the functions of all the organs of the body, iron is also called a tonic. Tonics are drugs which indirectly improve the action of the several organs of the body; usually they act by increasing the quality of blood or by aiding digestion, and thus rendering the digestion and absorption of the food more easy (*see* p. 110). We have seen that iron is probably not

absorbed, and hence it is at first sight difficult to understand how it can benefit anæmia. But the proposition that iron salts cannot be absorbed only refers to inorganic salts. It is obvious that iron in some form must be absorbed, if not the chicken could not get it from the yolk, and the growing child could not increase the quantity of its blood proportionately to its growth. It is noticeable that our food, like yolk of egg, only contains complex organic compounds of iron. As these must be absorbed we may conclude that they are in some way or other protected from decomposition in the alimentary canal, for we have seen that in all probability the inorganic compounds which would result if they were decomposed are incapable of absorption. Bunge's hypothesis is that in some forms of anæmia, especially chlorosis, organic salts of iron taken in the food are in some way split up in the intestines so as to be incapable of absorption. In those anæmic conditions which can be benefited by iron the administration of the inorganic salts prevents the decomposition of the organic salts in the food by fixing the decomposing agents, which according to Bunge are chiefly alkaline sulphides. This is supported by the fact that to cure chlorosis rapidly, enormous doses of iron are often found to be necessary; for example, a patient will take 6 gr. [.40 gm.] of reduced iron three times a day, or 18 gr. [1.20 gm.] a day. Now, the whole amount of iron in the blood of an ordinary healthy woman is not much if at all more than 30 gr. [2. gm.], for there is only one atom of iron in a molecule of hæmoglobin, which contains considerably over 2000 atoms. Supposing she had lost half her hæmoglobin, if the iron given were simply absorbed, one day's treatment would speedily restore her health, but it is well known that weeks are often required. Another argument pointing in the same direction is that arsenic, manganese, or copper will, it is stated, cure the anæmia almost as efficiently as iron.

Remote effects.—As iron in anæmic subjects increases the amount of hæmoglobin, more oxygen is carried to the tissues, and thus the whole body shares in the benefit of a course of iron, which has also been thought to have a direct effect on the

kidneys as a mild diuretic, and a direct effect in promoting the menstrual flow. These actions are, however, slight, and may be due to the general improvement in health. Iron salts have been given to produce abortion, but without any result. Remote astringent effects have been attributed to them, but there is no satisfactory proof that they have any; and, indeed, when we remember that very little if any iron is absorbed in an astringent form, we should hardly expect that salts of iron could be remotely hæmostatic or astringent.

Therapeutics of Iron and its Salts.

External.—Solutions of the sulphate, chloride, nitrate, and Liquor Ferri Subsulphatis (Monsel's solution), are the most valuable local astringents we have. It matters very little which of these is used. In England the solution of the chloride is perhaps oftenest employed. Either is of service in many cases—for example, to stop hæmorrhage from leach-bites, from the nose, from piles, or from the uterus, as in the hæmorrhage of malignant disease. A convenient way to employ them is on lint or cotton soaked in the solution, and a cavity such as the nose or uterus may be plugged with the lint. The aqueous solution of the chloride has been used as a spray for hæmoptysis, but as it may excite coughing, it is not to be recommended. These preparations form very [disagreeable] clots, which readily decompose and give rise to septic infection. It is very useful as an astringent for painting on the fauces, pharynx or tonsils in inflammation of these parts. It may, for this purpose, be diluted with an equal quantity of water, or a solution of 1 part of [ferric] chloride in 4 of glycerin may be used. It has been advised to paint erysipelatous skin with the tincture of [ferric] chloride. A solution of the sulphate (1 to 480) has been used in gleet.

Internal.—*Gastro-intestinal tract.*—The astringent preparations may be swallowed in cases of severe bleeding from the stomach, such as that of malignant disease, ulcer, or cirrhosis. If the bleeding is profuse, a drachm; [4. c.c.] of Liquor Ferri Chloridi with a drachm; [4. c.c.] of glycerin, to facilitate

ever, interferes with the iron in the intest
administer the laxative separately, so tha
lated according to circumstances.] The
given for diarrhœa, but there are many c
this symptom. Chronic constipation is
treated by a pill of [ferrous] sulphate and
but probably the efficient purgative in
although some claim that large doses of
overcome chronic constipation. [At least]
of the ferric salts is often much exaggerate

A rectal injection of a fluid drachm [4
of ferric chloride to half a pint of water [
worms [the patient being in the knee-chest

Arsenical poisoning is best treated by t
which should be freshly prepared by mix
[90. c.c.] of Liquor Ferri Tersulphatis wi
sodium carbonate diluted with water. Ha
should be given every five or ten minutes.
is formed, and may be gotten rid of by a
dose of magnesium sulphate or some oth
better method of using iron for this purpo

Blood.—The great use of iron salts is
of hæmoglobin in the number of red corpu
cially chlorosis. They are useless in pe
generally of little value if any in the

removal, if possible, of the cause of the anæmia, but recovery may be aided by the administration of iron. [Ferric] chloride and [ferrous] sulphate are two of the most efficacious preparations, and pills containing a grain [.06 gm.] of the dried sulphate, with aloes or nux vomica, if constipation is present, are very valuable. It is usual to begin with one pill containing one grain [.06 gm.] of the dried [ferrous] sulphate thrice a day, but gradually the number of pills may be increased till three or four are taken at a dose. This method of large doses of the sulphate often appears to cure more rapidly than smaller doses. If these astringent preparations cause indigestion, any of the milder preparations may be substituted. The carbonate may be given in pills in rapidly increasing doses, or the dose of reduced iron, conveniently given on bread and butter, may be pushed. Mistura Ferri Composita [Griffith's Mixture] is a disagreeable preparation to take and to look at, and the inky character of the aromatic mixture makes it undesirable. The styptic taste of some of the preparations, especially the astringent ones, may be concealed by giving them with a drachm [4. c.c.] of glycerin, which acts by its viscosity and by reducing some of the ferric to a ferrous salt. It is often added to the tincture of the chloride. The scale preparations hardly ever disagree; they are therefore used for patients with a delicate digestion, and for such it is much better to make no attempt to rapidly increase the dose, but to depend on small doses spread over a long period. Mineral waters containing iron (such as those of La Bourboule and Levico) or the red wines may be given in such cases, but they are not often advisable, as they contain so little iron. Treatment of anæmia by iron leads, of course, to the improvement of the numerous symptoms, such as amenorrhœa, constipation, dyspepsia, etc., which are dependent upon the anæmia. That form of neuralgia which is associated with anæmia usually yields to iron. Ferrous iodide has been given, sometimes apparently with success, in cases of rheumatoid arthritis. Large doses of iron (10, [.60 c.c.] or even 20 minims, [1.20 c.c.] of the tincture of the chloride every hour or two) have been given in diphtheria and other forms of bad sore throat, apparently with

considerable benefit. Erysipelas has been treated in the same way. Fever due to other causes is said to contra-indicate the use of iron.

Kidney.—Iron salts are reported to have a feeble diuretic action, but this is doubtful. The chloride is often given empirically for all forms of Bright's disease. Whether it does good is at present undecided.

As iron is liable to cause indigestion, it should not be given near a meal. Occasionally a patient is found who cannot take iron in any form, because of the headache and indigestion caused by it.

The different preparations of Iron.—These have already been classified into astringent and non-astringent. There are some, viz., the Iodide, the Phosphate, the Iron and Quinine Citrate, and the Iron and Strychnine Citrate, the value of which depends in part at least upon their other ingredients. [Ferric] Phosphate, which always contains some free Phosphoric Acid, is an excellent hæmatinic. It is used largely for children, because the syrup of it is very pleasant in taste, and also because it was formerly believed that the Phosphoric Acid would aid the growth of bones, especially in cases of rickets. Parrish's food and Dusart's syrup both have for their chief ingredient Ferric Phosphate; the dose of each is ½ to 2 fl. dr.; [2. to 8. c.c.] Easton's syrup is a syrup of the Iron, Quinine, and Strychnine Phosphates. It contains in 1 fl. dr. [4. c.c.], 1 gr. [.06 gm.] of [Ferric] Phosphate, ¾ gr. [.045 gm.] of Quinine Phosphate, and $\frac{1}{32}$ gr. [.002 gm.] of Strychnine. The dose is ½ to 1 fl. dr.; [2. to 8. c.c. Ferrous] Iodide has been introduced for cases in which we wish to gain the benefit of both elements, but the proportion of Iron to Iodine is small (7 to 17). It is especially prone to damage the teeth. The Iron and Quinine Citrate combine the virtues of both Iron and Quinine. It is a favorite, mild preparation for slight cases of anæmia, but must not be prescribed with Alkalies, as they precipitate the Quinine.

II. MANGANUM.

Mn.=54.8.

1. **MANGANI DIOXIDUM.**—[Manganese Dioxide. MnO_2=86.72.

Synonym.—Black Manganese Oxide.

SOURCE.—Native crude Manganese Dioxide containing at least 66 per cent. of the pure Dioxide.

CHARACTERS.—A heavy, grayish-black, more or less gritty powder. *Solubility.*—Insoluble in water or Alcohol.

Manganese Dioxide used for making Chlorine, Corrosive Mercuric Chloride and Potassium Permanganate.

Dose, 2 to 10 gr.; .12 to .60 gm.]

2. **[MANGANI SULPHAS.**—Manganese Sulphate. $MnSO_4+4H_2O$ =222.46. *Synonym.*—Manganous Sulphate.

SOURCE.—By heating the Dioxide with sufficiently strong Sulphuric Acid, evaporation and crystallization.

CHARACTERS.—Colorless, or pale, rose-colored, transparent tetragonal prisms, having a slightly bitter and astringent taste. *Solubility.*—In 0.8 part of water; insoluble in Alcohol.

IMPURITIES.—Zinc, copper, iron and alkalies.

Dose, 2 to 8 gr.; .12 to .50 gm.]

3. **POTASSII PERMANGANAS.**—Potassium Permanganate. $KMnO_4$[=157.67.]

SOURCE.—Caustic Potash, Potassium Chlorate and Manganese Dioxide are heated together. $6KOH+KClO_3+3MnO_2=3K_2MnO_4+KCl+3H_2O$. Potassium Manganate is boiled with water till the color changes to purple and the Permanganate is formed. $3K_2MnO+2H_2O=2KMnO_4+4KOH+MnO_2$. The liquid is neutralized with Carbon Dioxide and evaporated.

CHARACTERS.—Slender [monoclinic prisms of a dark purple color, almost opaque by transmitted, and of a blue, metallic lustre by reflected light, and having a taste at first sweet, but afterwards disagreeable and astringent.] *Solubility.*—In 16 parts of water; a grain [.06 gm.] gives a fine purple color to a gallon of water [3785. c.c.].

INCOMPATIBLES.—It is very readily deoxidized in the presence of organic matter. It is usually given as a pill or a tabella, and should be made up with kaolin, or an explosion will very likely take place.

IMPURITIES.—Potassium carbonate and manganese dioxide.

Dose, ½ to 2 gr.; [.03 to .12 gm.]

ACTION OF POTASSIUM PERMANGANATE.

External.—In a solid form it is a mild caustic, and is, when kept dry, a permanent salt Its most important action is that when moist it readily gives up its oxygen in the presence of organic bodies, and its solutions therefore quickly turn dark brown, manganese dioxide being formed. The power possessed by its solution of giving up oxygen makes it a **disinfectant, deodorant,** and **antiseptic,** especially as much of the oxygen is in the form of ozone. But its action as a germicide is very limited, for it so readily gives up its oxygen to the organic sub-

stances in which the micro-organisms flourish that it very soon becomes inert.

Internal.—Potassium permanganate, when taken internally, must be quickly decomposed Manganese salts cannot be absorbed by the intestine unless its epithelium is damaged. When they are injected into the blood they are excreted in the urine and into the intestine. Probably their action much resembles that of iron salts, but so little is known on this point that it is doubtful if they should be considered of value.

Therapeutics of Potassium Permanganate.

External.—Although potassium permanganate is not of much practical use as a germicide, it is commonly employed as a deodorant for drains, bed-pans, to wash utensils, and to wash the hands; for the last purpose it is suitable as being non-irritant. It has one advantage, namely, that it is easy by its change in color to see when it has lost its efficacy. One in 150 is a serviceable strength. Condy's red fluid consists of 8 gr. [50 gm.] of [potassium] permanganate to the fluid ounce [30. c.c.] of distilled water. It is expensive for purposes requiring a large quantity. It stains fabrics. The stain may be gotten out by applying sulphurous acid, but the fabric must be immediately rinsed in water, for sulphuric acid is formed.

Internal.—The liquor of potassium permanganate [B. P., 1 in 100 of distilled water], considerably diluted, can be used as a mouth wash or gargle in foul conditions of the mouth, or as an injection in cases of foul discharges, such as may occur with gonorrhœa, vaginitis, uterine disease or ozæna. Some consider that potassium permanganate is beneficial for the same cases of anæmia as iron, but it is not nearly so much used; others praise its power in amenorrhœa. It should be always given as a pill, for the taste of solution of it is very [disagreeable.] If it is of [any] use in anæmia, it probably acts in the same way as iron.

GROUP VI.

Aurum, Hydrargyrum.

I. AURUM.

Au=196.7.

[**AURI ET SODII CHLORIDUM.**—Gold and Sodium Chloride. A mixture composed of equal parts by weight of dry Gold Chloride ($AuCl_3$= 302.81) and Sodium Chloride (NaCl=58.37).

CHARACTERS.—An orange-yellow powder, odorless, having a saline and metallic taste, and a slightly acid reaction. *Solubility.*—Very soluble in water, and at least one-half is soluble in Alcohol.

Dose, $\frac{1}{30}$ to $\frac{1}{10}$ gr.; .002 to .006 gm.

THE ACTION OF GOLD AND SODIUM CHLORIDE.

In small doses gold and sodium chloride is supposed to promote appetite and digestion, to stimulate the functions of the brain and to be an aphrodisiac. Full doses cause nausea and vomiting, and finally impair nutrition. The toxic symptoms resemble those of poisoning by corrosive mercuric chloride.

THERAPEUTICS OF GOLD AND SODIUM CHLORIDE.

It is useful in irritative dyspepsia, gastro-duodenal catarrh, hypochondriasis, chronic ovarian irritation and ovaritis, in chronic albuminuria, hepatic sclerosis, granular kidney, as it prevents hyperplasia of connective tissue. It is a valuable remedy in the tertiary manifestations of syphilis, especially of the bones, and presents fewer disadvantages than does the corrosive mercuric chloride.]

II. HYDRARGYRUM.

Hg.=199.8.

1. [**HYDRARGYRUM.**—Mercury. *Synonym.*—Quicksilver.

SOURCE.—Cinnabar, the native Sulphide, is roasted or distilled with Lime, the volatile Mercury is condensed in suitable aludels.

CHARACTERS.—A shining, silver-white metal, easily divisible into small globules. Sp. gr. 13.5584.]

IMPURITIES.—Lead, tin, and other metals.

tity to make 100 pills.

Dose, 1 to 3 pills.]

6. HYDRARGYRI IODIDUM RUBRU

$HgI_2 = 452.86$. *Synonyms.*—Mercury Biniodide

SOURCE.—Mix hot solutions of Corrosive Me sium Iodide. Filter and dry the precipitated Red $HgI_2 + 2KCl$.

CHARACTERS.—A scarlet-red, amorphous pov insoluble in water, but freely soluble in a solution

IMPURITIES.—The same as of the Corrosive C

Dose, $\frac{1}{60}$ to $\frac{1}{10}$ gr.; [.001 to .006 gm.]

Preparation.

Liquor Arseni et Hydrargyri Iodidi.

Mercuric Iodide. *Synonym.*—Donovan's S Iodide, 10; and Red Mercuric Iodide, 10;

CHARACTERS.—A clear, pale-yellowish able, metallic taste.] *Strength.*—1 per cen

Dose, 1 to 10 m.; [.06 to .60 c.c.]

7. [HYDRARGYRI IODIDUM FLA

Yellow Mercurous Iodide. *Synonyms.*—Mercury P Mercury Iodide.

SOURCE.—By pouring a solution of Potassium water, 1000; into a solution of Mercurous Nitrat and distilled water, 1000. The precipitate is wash curous Nitrate is obtained from Mercury treated b

Nitrate. A liquid containing about 60 per cent. of Mercuric Nitrate. $Hg(NO_3)_2 = 323.58$, together with about 11 per cent. of free Nitric Acid.

SOURCE.—Dissolve Red Mercuric Oxide, 40; in Nitric Acid, 45; with distilled water, 15, and heat.

CHARACTERS.—A clear, nearly heavy, colorless liquid, having a faint odor of Nitric Acid. Sp. gr. about 2.100.]

IMPURITY.—Mercurous Nitrate.

9. **UNGUENTUM HYDRARGYRI NITRATIS.**—[Ointment of Mercuric Nitrate.] *Synonym*.—Citrine Ointment.

SOURCE.—Mix a hot solution of Mercury, 70; in Nitric Acid, 175; with Lard Oil, 760.

CHARACTERS.—A lemon-yellow ointment.

10. **HYDRARGYRUM AMMONIATUM.**—Ammoniated Mercury. NH_2HgCl [$= 251.18$.] *Synonyms.*—White Precipitate. [Mercuric Ammonium Chloride.]

SOURCE.—Mix solutions of Ammonia, 100; and Corrosive Mercuric Chloride, 100. $HgCl_2 + 2NH_4OH = NH_2HgCl + NH_4Cl + 2H_2O$. Filter and wash the precipitated Ammoniated Mercury.

CHARACTERS.—[White, pulverulent pieces, or a white, amorphous powder, having an earthy, afterwards styptic and metallic taste. *Solubility.*—Almost insoluble in water or Alcohol.]

IMPURITIES.—The same as of the [Corrosive Chloride.]

Preparation.

Unguentum Hydrargyri Ammoniati.—Ointment of Ammoniated Mercury. *Synonym*.—White Precipitate Ointment. [Ammoniated Mercury, 10; Benzoinated Lard, 90.]

11. [**HYDRARGYRI CYANIDUM.**—Mercuric Cyanide. $Hg(CN)_2 = 251.76$.

SOURCE.—By boiling pure Potassium Ferrocyanide with Mercuric Sulphate in water, and recrystallization from diluted Alcohol. $7HgSO_4 + 2K_4FeCN_6 = Hg + 6HgCN_2 + 4K_2SO_4 + Fe_2(SO_4)_3$.

CHARACTERS.—Colorless or white prismatic crystals, odorless, having a bitter, metallic taste. *Soluble.*—In 12.8 parts of water, and 15 parts of Alcohol.

Dose, $\frac{1}{8}$ **to** $\frac{1}{10}$ **gr.; .001 to .006 gm.**

12. **HYDRARGYRI SUBSULPHAS FLAVUS.**—Yellow Mercuric Subsulphate. $Hg(HgO)_2SO_4 = 727.4$. *Synonyms.*—Turpeth Mineral. Basic Mercuric Sulphate.

SOURCE.—By solution of Mercury, 100; Sulphuric Acid, 30; Nitric Acid, 25; water, a sufficient quantity; decantation, drying of the residue.

CHARACTERS.—A heavy, lemon-yellow powder, odorless and almost tasteless. *Solubility.*—In about 2000 parts of water; insoluble in Alcohol.
Dose, 2 to 4 gr.; .12 to .24 gm.]

ACTION OF MERCURY AND ITS SALTS.

External.—[Corrosive mercuric chloride] is one of the **most powerful** and important **antiseptics** with which we are acquainted. In 1870 it was discovered that 1 part in 6000 would kill infusoria and spermatozoa. Now it is known to be a universal germicide. The published results of experiments with it vary very much, because the duration of the action, the solvent, and the micro-organism experimented upon, are not always the same. Evans (Guy's Hosp. Rep., vol. xlvii) found that anthrax spores were destroyed by [corrosive mercuric chloride] solutions of 1 in 1000 acting for a quarter of an hour, and 1 in 3000 acting for one hour. The bacilli themselves were destroyed by solutions of 1 in 15,000 acting for one minute, and 1 in 25,000 acting for half an hour. A solution of 1 in 70,000 prevented the growth of the spores, and one of 1 in 500,000 prevented the growth of the bacilli. A reference to carbolic acid (*q. v.*) will show how much more powerful corrosive mercuric chloride is. A solution of 1 in 1000 is very commonly employed for many disinfecting purposes. If albumin be present in the fluid to be disinfected, an albuminate of mercury is formed, and the antiseptic value of the fluid is destroyed. This change may be prevented by the addition of 5 parts of either hydrochloric or tartaric acid to 1 of corrosive mercuric [chloride.] The [red mercuric iodide] is also a powerful antiseptic. Metallic instruments cannot be disinfected with the [corrosive chloride] for mercury deposited on them.

Most mercurials, especially the oleate, oxide, ammoniated, nitrate and [corrosive chloride], will destroy the animal and vegetable parasites that infest the skin; they are, therefore, **antiparasitic.** Also, most of them will occasionally relieve itching, even when no cause is to be found.

The mercurial preparations, especially the red mercuric iodide and the nitrate, are powerful irritants. The latter is strongly

caustic. Mercurous salts are slightly irritant and stimulating; calomel is sometimes applied to sores for this property.

Metallic mercury and its salts are **absorbed by the skin**, especially when rubbed in either as an oleate or an ointment. These preparations are al-o taken up, although to a less degree, if simply applied to the skin, which likewise allows the metal or its salts to pass through when in the form of a fine vapor. All the symptoms of mercurial poisoning can be produced if the drug is absorbed through the skin. The **vapor** can be **absorbed** through the mucous membrane of the **lungs.**

Internal.—Although the different salts of mercury have different external actions, after absorption their actions are, in most respects, similar. The long-continued use of excessive doses of mercurials produces well-marked and important symptoms (*see* Toxicology). The actions for which mercurials are used in medicine are the following:

Stomach and intestines.—The **metal** mercury itself and **mercurous** compounds, being **mildly irritant** in their action, are often used as **purgatives**; but the mercuric compounds given in the same doses produce severe gastro-intestinal irritation. The action is chiefly on the duodenum and upper part of the jejunum; the precise mode of irritation is unknown, but it is certain that, in consequence of the administration of the mercurial, the contents of the duodenum are hurried along before there is time for the bile to be reabsorbed, and hence the motions are very dark-colored. There is probably some, but not an excessive increased secretion from the intestinal walls, for the motions, although large and loose, are not watery. As the action of the mercurial is chiefly on the upper part of the intestine, it is greatly assisted by giving a saline purge a few hours after it, for this will act more on the lower part of the bowel. The contents are passed along so quickly, that it is doubtful whether there is time for much mercury to be absorbed if a purgative dose of it has been given. Calomel and the metallic preparations are the two forms most used as purgatives. The former is the more powerful.

Whatever compound of mercury is taken by the mouth, it, in

the stomach, becomes a complex albuminate containing mercury, sodium, chlorine, and albumin. This compound in the presence of the sodium chloride in the stomach, can exist in solution there. Precisely what happens to it in the duodenum is doubtful; but it is quite certain that if the dose is insufficient to cause purgation some mercury is absorbed, the rest passing out of the bowel as a sulphide.

Liver.—It was formerly taught that calomel increased the amount of bile formed by the liver. This is now known to be an error, but [corrosive mercuric chloride] increases it, and possibly, occasionally when calomel is administered, some of it is converted into the [corrosive chloride]. Large doses of calomel are said to slightly diminish the secretion of bile Calomel and, to a less extent, preparations of metallic mercury are, however, called **indirect cholagogues,** because they, in the manner already explained, aid the excretion of bile.

Blood.—After absorption the mercurial compound formed in the stomach and intestines probably becomes oxidized, and circulates as an oxyalbuminate. Minute, long-continued doses of mercury slightly increase the richness of the blood in red corpuscles, and in animals may add a little to the weight of the body. **Large doses** produce **anæmia.**

Remote effects.—Mercury is excreted by the saliva, bile, urine, sweat, and milk. In small doses no effects can be attributed to this, but in large doses mercury irritates the salivary glands and is a powerful **sialogogue.** By itself it is a feeble diuretic, but it sometimes powerfully aids other diuretics. It is eliminated very slowly, and hence accumulates in the body.

Therapeutics of Mercury and its Salts.

External.—*Antiseptic action.*—Solutions of the corrosive chloride are very largely employed. A strength of 1 in 1000 is used for washing the hands, for washing the parts to be operated upon, for soaking towels, lint, sponges, etc., used in operations, for washing infected articles, infected rooms, furniture, linen, etc. For wounds and cavities (as the uterus), the strength for a

single washing should not exceed 1 in 2000, for continual irrigation 1 in 10,000.

Antiparasitic action.—White precipitate ointment, diluted [mercuric] nitrate ointment, and a wash of [corrosive] chloride are very useful for destroying lice on the head; and these three, especially the last, are excellent for destroying the fungus in ringworm and favus. The oleate of mercury is useful for destroying that in pityriasis versicolor; if the skin is easily irritated it should be sufficiently diluted. Mercurials should not be applied over so large an area that there is a risk of poisoning from absorption.

Irritant action.—The solution of the nitrate is used to destroy warts, condylomata, etc.; no doubt much of its caustic action is due to the free nitric acid it contains. Milder preparations, such as the ointment of [mercuric] nitrate, or of red [mercuric] oxide, if diluted, may be used for tinea tarsi; and the same ointments are very beneficial to any ulcer or sore that requires a stimulant, whether or not it be syphilitic. When a milder preparation is required calomel is often dusted on the part; and black wash [Lotio Hydrargyri Nigra, P.B.—Calomel, 1; lime water, 146]; is very commonly used, especially for syphilitic sores and condylomata.

Itching.—Black wash, yellow wash [Lotio Hydrargyri Flava] (*see* p. 193), or Unguentum Hydrargyri may be employed to relieve the itching of skin diseases, such as pruritus senilis and urticaria, if they are not too extensive. A very favorite ointment for many skin diseases is composed of equal parts of diluted mercuric nitrate, zinc oxide and lead [acetate] ointments (*see* p. 166.)

Absorbent action.—All mercurial ointments and the oleate, when applied to or gently rubbed into any part which is chronically inflamed, often aid the absorption of the products of inflammation, if they are not too deep-seated. For this purpose blue ointment, or the oleate, are very commonly used for chronic inflammation of joints, chronically enlarged glands, and chronic peritonitis, which certainly sometimes appears to be cured by the

application of a binder spread with one of these preparations or the Linimentum Hydrargyri [B. P., which consists of 1 part each of mercurial ointment, solution of ammonia and camphor liniment] even when the disease is tuberculous. The ointment of the red [mercuric] iodide is, in India, applied to the thyroid gland in goitre.

Internal.—*Alimentary canal.*—Very dilute solutions (4 gr. [.24 gm.] to 10 fl. oz. [300. c.c.] water with 8 minims [.50 c.c.] of diluted hydrochloric acid) may be used as a mouth wash for syphilitic ulceration. Ringer advises gray powder [Hydrargyrum cum Creta] in minute doses for the sudden vomiting immediately after food sometimes met with in children. By far the most important intestinal action of mercury is its purgative effect. Calomel and blue pill are pre-eminently the purgatives to employ when there is, from the headache, constipation, furred tongue, feeling of weight over the liver, and general lassitude, reason to suspect that the dyspepsia is hepatic. Either of these drugs at night, followed by a watery purge, in the morning, will often completely relieve the symptoms. The blue pill at night, and black draught (Infusum Sennæ Compositum) in the morning have long been a favorite combination. Mercury or calomel is also one of the best purgatives for cases of cirrhosis, and for cardiac cases in which there is considerable hepatic congestion. Gray powder mixed with a little sugar is an excellent purgative for children, or even for adults, when a very mild purge is required—as, for example, after severe enteritis or peritonitis, or if it is desirable to open the bowels during typhoid fever. Children take mercury very well. Infants can easily bear grain [.06 gm.] doses of the gray powder. As diarrhœa, especially in children, is so often due to the presence of some irritant, a simple purgative, as gray powder, will, by removing it, often cure the diarrhœa. This preparation hardly ever causes griping, but calomel is liable to do so.

Remote uses.—In cases of heart disease mercury is often combined with digitalis and squill as a diuretic (as in the well-known Guy's diuretic pill: blue pill, powdered squill root, powdered

digitalis leaves, of each 1 gr. [.06 gm.]; extract of hyoscyamus, 1½ gr. [.10 gm.]), and in some cases this combination does great good.

Syphilis.—Mercury in any form is powerfully antisyphilitic. This action is so important that it makes mercury one of the most valuable drugs we have. It has already been mentioned that it may be applied locally to syphilitic ulcerations, but to be of any use it is essential that it should also be administered so as to reach the blood. It is a direct antidote to the syphilitic virus; it can completely cure the patient; its use must be continued over a long time, but it should never be pushed to salivation. Treatment should be begun at as early a stage as possible, as soon as the diagnosis is established. It is especially valuable in the primary and secondary stages; authorities differ as to its value in tertiary syphilis. It is as efficacious for the congenital as for the acquired disease. It is also administered for many non-syphilitic varieties of chronic inflammation, but not so often as formerly. Patients with disease of the kidneys do not bear it well.

Modes of administration of mercurials.—(1) **By the mouth.**—The Liquor Hydrargyri Perchloridi [B. P. which is Corrosive Mercuric Chloride, 1; Ammonium Chloride, 1; water, 1000] is often given to adults, usually in doses of 1 to 2 fl. dr. [4. to 8. c.c.] For the later symptoms of syphilis, Potassium Iodide is often combined with it. Mercuric Iodide is formed and is kept in solution by the excess of Potassium Iodide. Mercurous Iodide, known as the [yellow] Iodide, is much used by some. It is insoluble in water, and is incompatible with Potassium Iodide, red [Mercuric] Iodide and metallic Mercury being formed. It does not keep well. The best preparation for children is ½ to 1 gr. [.03 to .06 gm.] of gray powder, given just often enough to avoid purgation.

(2) **By the rectum.**—Occasionally Mercury is given as a suppository, [which is official in the B. P. Each contains 5 gr. [.30 gm.] of Mercurial ointment.]

(3) **Endermically.**—Mercurials, especially calomel, are often dusted on sores and ulcers, and lotions are also locally applied. Mercury can be absorbed in this way.

(4) **By inunction.**—Blue ointment may be rubbed into the skin. The best position is the inner side of the thigh. Usually a piece the size of the top of the thumb, rubbed in once a day, is enough. It has been put inside the

sock, for then it is rubbed into the foot during walking. A very efficient way of applying the ointment in children is to smear it on a flannel binder which is worn round the abdomen. The Oleate may be employed for inunction. Mercury is rapidly absorbed by these means.

(5) **Hypodermatically.**—One-eighth of a grain [.008 gm.] or less of the [Corrosive] Chloride dissolved in about 5 to 8 minims [.30 to .50 c.c.] of distilled water is used for a dose. The needle of a hypodermatic syringe is plunged deeply into some muscles, preferably those of the gluteal region, and to the outer side of it, so that the patient does not sit or lie on the spot. One-sixth of a grain [.01 gm.] of morphine in solution [may be, if necessary,] injected. The needle is left *in sitû*, the syringe is taken off and filled to the required dose with the [Corrosive] Chloride solution, which is injected through the needle. If much pain is caused, a piece of ice may be held over the part before the injection and after the needle is withdrawn. The injection should be repeated daily; before going to bed is a good time. With proper care no abscesses result. This is a very rapid and thorough way of bringing the patient under the influence of mercury.

(6) **Fumigation.**—Calomel [or the Red Mercuric Sulphide known as Cinnabar (not official) the amount required being about a drachm; 4. gm.] is used. The patient, who is naked, sits on a cane-bottomed chair; a blanket, which reaches to the floor, is fastened lightly round his neck. Twenty grains [1.20 gm.] of Calomel are placed in a porcelain dish, over a spirit lamp, under the chair. The Calomel volatilizes, and is absorbed by the skin. A bath should last twenty minutes; with obvious modifications this method may be applied to patients in bed.

(7) **Inhalation.**—This is rarely or never used.

(8) **Baths** of three drachms [12. gm.] of the [Corrosive] Chloride to thirty gallons [114 Liters] of water, with one fluid drachm [4. c.c.] of Hydrochloric Acid added, have been used, but they are very rarely employed.

Toxicology.

Acute poisoning is [not] rare. Salts of Mercury, especially the Mercuric salts, produce severe gastro-intestinal irritation, causing great pain, vomiting and diarrhœa. The Corrosive [Chloride] and White Precipitate are the preparations usually taken. [In case of acute poisoning albumin, the white of an egg (one being sufficient for 4. gr.; .24 gm. of the Corrosive Chloride, the albuminate re-dissolving in an excess), milk and flour are useful. Vomiting should be induced by mustard and lukewarm water, apomorphine or by irritation of the fauces.]

Chronic poisoning by Mercury or its salts produces a train of remarkable symptoms. They were very common when it was the practice to give larger doses of Mercurials than are now employed, and they are occasionally seen in

those who work in Mercury. In the present day, when the patient shows any sign of Mercurialism, the dose is reduced. The symptoms (which constitute Hydrargyrism or Mercurialism) may be brought about, however the Mercury is taken. The first indications noticed are slight fœtor of the breath and soreness of the gums when the teeth are brought forcibly together, by closure of the jaws. Then follows a disagreeable metallic taste in the mouth, the gums become swollen and soft, and they bleed readily. Next there is a considerable increase in the amount of saliva secreted. All these symptoms gradually become more marked, and the tongue swells. The teeth are now loose, the saliva, which is thick and viscid, pours from the mouth, the parotid and salivary glands are enlarged and tender, and there is a slight rise of temperature. In olden days the symptoms occasionally ended in the falling out of the teeth, extensive ulceration of the mouth and tongue, necrosis of the jaw, great weakness, emaciation, anæmia, a watery state of the blood, a liability to hæmorrhages, exhaustion and death.

More rarely the symptoms are, for the most part, nervous. These occur, chiefly, if not entirely, among those who work in the metal and inhale the vapor. The first to be observed is tremor, beginning in the face, then invading the arm, and afterwards the legs. Early in the case the trembling is seen only on movement; soon it is permanent. It resembles paralysis agitans. Usually there is considerable weakness of the affected muscles ("Mercurial palsy"). There may be pains, and a weak mental condition is common. Nothing has been found, *post-mortem*, to account for these symptoms.

GROUP VII.

Arsenic, Antimony, Chromium.

The compounds of these metals have several physiological and some chemical points in common. The oxide of each is externally a powerful caustic. Internally Arsenic, Antimony, and (as far as we know) Chromium compounds are severe gastro-intestinal irritants. Arsenic and Antimony in large doses both cause general fatty degeneration.

I. ARSENUM.

As=74.9.

1. **ACIDUM ARSENOSUM.**—[Arsenous Acid. $As_2O_3 = 197.68$.

Synonyms.—Arsenic Trioxide. White Arsenic.]

SOURCE.—Arsenical ores are roasted and purified by sublimation.

CHARACTERS.—A [heavy, solid, occurring either as an opaque, white powder, or in irregular masses of two varieties—the one amorphous, trans-

Synonym.—Fowler's solution. Arsenous A
bonate, 20; Compound Tincture of Lavend
distilled water to make 1000.] Probably
Strength.—1 per cent. of Arsenous Acid.

Dose, 2 to 10 m.; [.12 to .60 c.c.]

2. Liquor [Acidi Arsenosi.—Solution
nous Acid, 10; is boiled with diluted Hy
distilled water to make 1000.] No decomp
—1 per cent. of Arsenous Acid.

Dose, 5 to 10 m.; [.30 to .60 c.c.]

2. SODII ARSENAS.—Sodium Arsenate.
311.46.]

SOURCE.—Heat to redness Arsenous Acid, Sod
Carbonate; dissolve the fused mass in water and c
arsenate is formed. $As_2O_3 + 2NaNO_3 + Na_2CO_3 =$
On adding water to the Pyroarsenate, a solution of
crystallizes on standing, is formed. $Na_4As_2O_7 + H$
crystallizes with $7H_2O$.

CHARACTERS.—Colorless, transparent, [monocli
alkaline taste. *Solubility.*—In 4 parts of water.]

Dose, $\frac{1}{30}$ to $\frac{1}{10}$ gr.; [.002 to .006 gm.]

Preparation.

Liquor Sodii Arsenatis.—[Solution of
onym.—Pearson's solution (Pearson's solutio
strong as the official Liquor Sodii Arsenatis).

SOURCE.—Dissolve Sodium Arsenate, 1
crystallization by heat, in distilled water, 100.

CHARACTERS.—[Glossy orange-red, crystalline masses, or shining orange-red, crystalline scales, having an Iodine-like odor or taste. *Solubility.*—In 7 parts of water, and in 30 parts of Alcohol.]

Dose, $\frac{1}{30}$ **to** $\frac{1}{10}$ **gr.; [.002 to .006 gm.]**

Preparation.

Liquor Arseni et Hydrargyri Iodidi. *See* Mercury, p. 194.

ACTION OF ARSENICAL COMPOUNDS.

External.—Arsenous acid has no action on the skin, but applied to raw surfaces it is a powerful **caustic.**

Internal.—*Alimentary canal.*—Unless the dose be very small, all preparations containing arsenic are very severe **gastro-intestinal irritants** (*see* Toxicology). In minute doses they are gastric stimulants, causing dilatation of the gastric vessels and an increased flow of gastric juice. Small doses also stimulate the duodenum.

Blood.—Arsenic is absorbed into the blood. Nothing is known of its physiological action there; but it can, in some forms of anæmia, increase the hæmoglobin and the number of red corpuscles.

Circulation.—In the frog the rapidity and force of the heart are lessened till it finally stops. This is a local action, for it takes place when applied to the excised heart.

Remote effects.—In many diseases arsenic evidently profoundly affects metabolism, for the patient recovers under treatment by this drug. It is doubtful whether, if given in small doses to healthy persons, it usually does more than sharpen the appetite. It has been stated by Dogiel to unite with albumin; another view, that of Binz and Schulz, is that arsenous acid becomes arsenic acid by taking oxygen from the protoplasm, but that the arsenic acid subsequently yields up the oxygen again. Some of the people in Styria eat white arsenic in small quantities, and it is said to increase their strength and clear their complexion. Wood concludes that small doses of arsenic check tissue change and decrease nitrogenous elimination, whilst toxic doses have the opposite effect. But there is no proof of any of these state-

External.—Formerly arsenic was use
growths, lupus, warts, etc., either as pure
paste. Arsenous acid, 1; charcoal, 1; r
4 parts; and water, *q. s.*, is the formul
popular. It must be used strong enoug
dead tissue slough out quickly, or else th
soned, for the arsenic is rapidly absorbe
calomel, 8; antimony [sulphide, 8 parts;]
Liquor potassii arsenitis has been recomm
application for corns.

Internal.—*Alimentary canal.*—Arse
destroy the tooth pulps before filling teeth

In some forms of dyspepsia small dose
arsenitis are occasionally given to stimulate
is so liable to cause sickness, diarrhœa, a
poisoning, that it is a rule always to begin a
doses, say 3 or 4 minims [.20 to .25 c c.]
arsenitis, or $\frac{1}{60}$ to $\frac{1}{40}$ gr. [.001 to .0015 gr
a pill, and to gradually increase the quan
form should always be taken immediatel
dilute it by the contents of a full stoma
well; old people do not. Very small d

ficial skin diseases not owing their cause to an irritant. It is, therefore, largely used for psoriasis, pemphigus, and sometimes for chronic eczema. It is of no use in the acute stages of these maladies, nor if cutaneous inflammation is deep-seated; it is likely, even, to aggravate the condition.

Cases of anæmia which cannot be cured by iron, and which fall under the heading of primary anæmia, may be occasionally much improved by arsenic. Such are pernicious anæmia, splenic leucocythæmia, and Hodgkin's disease; but often no drug is of any avail. In other forms of anæmia, such as chlorosis, arsenic may be given, often with benefit, when iron compounds disagree. Arsenic is, next to quinine, the best antiperiodic we have; but it is not nearly so efficacious. It may, however, in the absence of quinine, be used for ague, and is especially valuable for the anæmia which follows ague, and for neuralgia due to the same cause. It often does distinct good in rheumatoid arthritis if given for a long while. It is frequently prescribed for chorea, particularly in rapidly increasing doses; but it is difficult to prove that the cases get well more quickly than they would without any drug. Arsenic has been strongly recommended in asthma and in hay fever. For asthma it may be given by the mouth, or smoked as cigarettes, made by saturating bibulous paper in a solution of fifteen grains [1. gm.] of [potassium] arsenite to an ounce [30. c.c.] of water. It has been given in phthisis, but without benefit.

Toxicology.

Acute Poisoning.—[Arsenous Acid] is frequently used as a poison. Soon after taking it the sufferer experiences faintness, nausea, sickness, epigastric pain and tenderness. These symptoms quickly increase. The vomit is brown, and often streaked with blood; the pain is very severe; there is profuse diarrhœa, with much tenesmus; and there are cramps in the calves of the legs. The vomiting becomes violent and incessant; there is a burning sensation in the throat, with intense thirst. Soon severe collapse sets in; the skin is cold, the pulse small and feeble, and the patient dies [in collapse]. *Post-mortem.*—The stomach is intensely inflamed, even if the Arsenic has not been taken by the mouth, but has been applied in large quantities to cancerous growths. This shows that Arsenic is excreted from the blood into the stomach. The small intestines are also acutely inflamed.

Treatment.—Wash out the stomach. Give emetics (*see* p. 128), choosing the least irritating and least depressing. The stomach must be completely emptied. Give unlimited quantities of freshly prepared humid [Ferric Hydrate] (*see* p. 176) or dialyzed iron. If neither of these is handy, give Magnesia in large amounts, or large doses of Castor Oil and water. Give Brandy or Ether subcutaneously; apply hot blankets and bottles to the feet and the abdomen.

Chronic Poisoning.—Often, when Arsenic is taken as a medicine, slight symptoms of poisoning are seen. They are loss of appetite, nausea, perhaps vomiting, slight abdominal pain, and mild diarrhœa. The eyelids become a little puffy, the conjunctivæ injected, the eyes and nose water, and there is slight headache. These symptoms, of course, show that the dose given is too large, and that it must be decreased.

Arsenic is so often used in the manufacture of all sorts of articles, especially wall papers and fabrics, that chronic poisoning by it is frequently seen. It is also met with in workers of Arsenic, and in persons to whom it has been given with intent to murder. The symptoms produced are those already mentioned as present when large doses of Arsenic are taken medicinally.

Long-continued use of Arsenic may induce peripheral neuritis; the chief symptoms of arsenical neuritis are herpes zoster, paralysis of the muscles of the limbs, especially the extensors of the hands and feet, ataxic gait, severe darting pains in the limbs, and rapid muscular atrophy. Several cases are recorded in which Arsenic has caused general brown pigmentation of the skin. It may also give rise to brown pigmentation of patches of psoriasis. After death from chronic poisoning, in addition to the gastro-intestinal and nervous lesions, there is wide-spread fatty degeneration of most of the organs of the body. It is well seen in the liver, kidneys, stomach and muscles, including the heart.

Repeated doses given to animals abolish the glycogenic function of the liver, so that puncture of the floor of the fourth ventricle no longer causes glycosuria. In frogs poisoned with Arsenic the epidermis peels off very easily. This is due to degeneration of its lower cells, the degeneration proceeding from the lowest layer outwards.

II. ANTIMONIUM.

Sb. = 119.6.

1. ANTIMONII SULPHIDUM.—[Antimony Sulphide. Sb_2S_3 = 335.14. *Synonym.*—Antimony Trisulphide.

SOURCE.—Native Antimony Sulphide purified by fusion, as free from Arsenic as is possible.

CHARACTERS.—Steel-gray masses of a metallic lustre and a striated crystalline fracture, forming a black or grayish-black, lustreless powder without odor or taste. *Solubility.*—Insoluble in water or Alcohol.

Preparations.

1. **Antimonii Sulphidum Purificatum.**—Purified Antimony Sulphide. $Sb_2S_3 = 335.14$. *Synonym.*—Purified Black Antimony.

SOURCE.—Antimony sulphide, 100; purified by Ammonia Water, 50; decanted and dried.

CHARACTERS.—A heavy, grayish-black, lustreless powder, without odor or taste.

IMPURITY.—Silica.]

2. **Antimonium Sulphuratum.**—Sulphurated Antimony. Chiefly Antimony Sulphide (Sb_2S_3) and with a small amount of Antimony Oxide (Sb_2O_3). [*Synonym.*—Kermes mineral.

SOURCE.—Boil Purified Antimony Sulphide, 100; and Solution of Soda, 1200.] $Sb_2S_3 + 4NaOH = NaSbO_2 + Na_3SbS_3$. Precipitate with Sulphuric Acid, wash, and dry. $NaSbO_2 + Na_3SbS_3 + 2H_2SO_4 = Sb_2S_3 + 2Na_2SO_4 + 2H_2O$.

CHARACTERS.—[An amorphous reddish-white powder, becoming lighter in color on exposure to light. *Solubility.*—Insoluble in water or Alcohol.]

Sulphurated Antimony is contained in Pilulæ Antimonii Compositæ.

Dose, ⅙ to 1 gr.; [.01 to .06 gm.]

2. **ANTIMONII OXIDUM.**—[Antimony Oxide. $Sb_2O_3 = 287.07$ *Synonym.*—Antimony Trioxide.]

SOURCE.—Pour a solution of Antimony Chloride into water. Antimony Oxychloride is precipitated. $SbCl_3 + H_2O = SbOCl + 2HCl$. The precipitate is treated with Sodium Carbonate, washed, and dried. $2SbOCl + Na_2CO_3 = Sb_2O_3 + 2NaCl + CO_2$.

CHARACTERS.—[A heavy grayish-white powder, without odor or taste.]

IMPURITIES.—Higher oxides.

Dose, 1 to 4 gr.; [.06 to .24 gm.]

Preparation.

Pulvis Antimonialis.—[Antimonial Powder. *Synonym.*—James' Powder. Antimony Oxide, 33; Precipitated Calcium Phosphate, 67.

Dose, 3 to 15 gr.; .20 to 1.00 gm.]

3. [**ANTIMONII ET POTASSII TARTRAS.**—Antimony and Potassium Tartrate. $2K(SbO)C_4H_4O_6 + H_2O = 662\ 42$. *Synonyms.*—Tartar Emetic. Tartrated Antimony.]

SOURCE.—Make a paste of Antimony Trioxide (Sb_2O_3) with Acid Potassium Tartrate and water. Let it stand twenty-four hours, boil in water, and crystallize. $2KHC_4H_4O_6 + Sb_2O_3 = 2K(SbO)C_4H_4O_6 + H_2O$.

CHARACTERS.—Colorless transparent [crystals of the rhombic system, becoming opaque and white on exposure to air; or a white granular powder, having a sweet, afterwards disagreeable metallic taste. *Solubility.*—In 17 parts of water; insoluble in Alcohol.]

INCOMPATIBLES.—Gallic and tannic acids, most astringent infusions, alkalies, and lead salts.

IMPURITY.—Acid Potassium Tartrate.

Dose, $\frac{1}{10}$ **to** ½ **gr.** [.006 **to** .03 **gm.**] (diaphoretic), ½ **to** 1 **gr.** [.03 **to** .06 **gm.**] (cardiac depressant), 1 **to** 2 **gr.** [.06 **to** .12 **gm.**] (emetic).

Preparations.

1. **Vinum Antimonii.**—[Wine of Antimony. Antimony and Potassium Tartrate, 4; boiling distilled water, 65; Alcohol, 150; White Wine to 1000.

Dose, 5 to 60 m.; .30 to 4.00 c.c.

2. **Syrupus Scillæ Compositus.**—Compound Syrup of Squill. *Synonym.*—Hive Syrup. Fluid extract of Squill, 80; fluid extract of Senega, 80; Antimony and Potassium Tartrate, 2; Sugar, 750; Precipitated Calcium Phosphate, 10; water to 1000.

Dose, 5 to 30 m.; .30 to 2.00 c.c.]

ACTION OF ANTIMONIAL COMPOUNDS.

External.—Antimonial compounds are powerful external **irritants.** The Liquor Antimonii Chloridi [of the B. P., which is a solution of antimony chloride in hydrochloric acid] is a severe **caustic.** Tartar emetic produces a **pustular eruption** at the point of application.

Internal.—*Alimentary canal.*—All compounds of antimony are powerful **irritants,** internally as well as externally; the action of **tartar emetic** is best known. The first result of swallowing this is **vomiting.** The early acts of vomiting are due to the direct action of the drug on the wall of the stomach, but it is quickly absorbed, and by its action on the medulla it also produces sickness; thus the vomiting is continued for some time. It will produce vomiting when injected into the blood, chiefly by its action on the medulla—for it will act if the stomach is replaced by a bladder—but also because some of it is excreted into the stomach. In large doses tartar emetic is irritant to the intestine.

Heart.—Antimony acts upon man as upon the lower animals. It is a powerful **cardiac depressant,** diminishing both the frequency and the force of the beat of the heart. Experiments on animals have shown that the final stoppage takes place in diastole, and that the chief action of antimony is that of a direct depressant to the cardiac muscle itself. Of course, the cardiac depression causes the arterial pressure to fall; but part of this effect is due to a coincident action upon some portion of the vaso-motor system; the probability being that antimony, by paralyzing the muscular coat of the arteries, relaxes them.

Respiration—Respiration is depressed, the movements become weaker, and inspiration is shortened, but expiration is prolonged. Finally, the pauses become very long and the movements very irregular. The cause of this is not known; probably it is very complex.

Nervous and muscular systems.—Here also antimony acts as a **powerful depressant,** especially to the spinal cord, and to a less extent to the brain; hence moderate doses cause a feeling of languor, inaptitude for mental exertion, and sleepiness. Experiments on animals show that after the administration of large doses of antimony reflex movement is soon lost, and that this is due to a depressing effect on the sensory part of the spinal cord. This depressant influence is felt also in the muscles, and hence antimony will relieve spasm, but whether it does so by direct action on the muscles or by acting on the nervous system is doubtful.

Temperature.—Moderate doses of antimony have little influence on the temperature, but large doses cause a **considerable fall,** due, no doubt, in the main to the circulatory depression, but, also, it is said, to a direct action in decreasing the amount of heat produced.

Excretion.—Antimony is excreted by many channels. We have seen that part of its emetic effect is due to its excretion into the stomach. It passes out by the bronchial mucous membrane, increasing the amount of secretion, and thus acting as an **expectorant.** On the skin its action is that of a **diaphoretic.**

This is chiefly a secondary result of the depression of the circulation, but is possibly in part a direct local effect. In frogs the action on the skin is very like that of arsenic, but antimony softens rather than detaches the epidermis, which thus becomes a jelly-like mass. It is excreted in the bile, and aids its flow; therefore it is a **cholagogue.**

In passing through the kidneys it may be slightly diuretic, but this depends upon the amount of perspiration produced by it. If its use is continued for some time it will cause, like arsenic, fatty degeneration, especially of the liver, and abolition of the hepatic glycogenic function.

Therapeutics of Salts of Antimony.

External.—A solution of antimony chloride, known as butter of antimony, has been used as a caustic, but its employment has been abandoned, as the sore produced is difficult to heal. Many years ago an ointment of tartar emetic was commonly applied as a counter-irritant, but it causes much pain, and is now seldom used.

Internal.—*Alimentary canal.*—Tartar emetic is not to be recommended as an emetic, for the action is slow, and the general depression of emetic doses is great. For this reason it should never be given to produce purgation. The only cases in which it is permissible are those in which an emetic is required for laryngitis, bronchitis, or some other acute inflammatory condition of the respiratory tract, for then its depressant action on the circulation may perhaps be beneficial, but usually ipecacuanha is preferable.

Circulation.—Antimony was formerly largely employed, especially in combination with aconite, to reduce the force and frequency of the pulse in all sorts of febrile conditions; but this is now generally thought unnecessary. If it is to be used, it is especially indicated in respiratory affections; for then its expectorant effect may be valuable.

Respiration.—It has been very much given for the early stage of acute bronchitis; but certainly it should not be continued

after a free secretion of bronchial mucus has been set up by it. After that it is, on account of its depressing influence, an undesirable expectorant.

Nervous and muscular systems.—Its use as a sedative in delirium tremens is now abandoned, and the introduction of chloroform has made it unnecessary to employ tartar emetic to relax muscular spasm in herniæ, dislocations, etc.

Remote effects.—Occasionally it is given in fevers for its diaphoretic influence and for its slight antipyretic action. Sometimes it is ordered as a cholagogue; but, because of its powerful depressant action, it is less used as a medicine than formerly.

Toxicology.

Acute Poisoning.—The symptoms are very like those of arsenical poisoning (*see* p. 207). *Post-mortem.*—The gastro-intestinal irritation is very similar, but it is not nearly so marked.

Treatment.—Unless the vomiting is very free, Apomorphine [Hydrochlorate] subcutaneously, or Zinc Sulphate by the mouth or the stomach pump, may be used. Also frequent doses of half a drachm [2. gm.] of Tannic or Gallic Acid dissolved in water, strong tea or coffee, mucilaginous drinks, and stimulants subcutaneously. Hot water bottles and warm blankets may be necessary.

Chronic Poisoning is not sufficiently common to call for notice here.

III. CHROMIUM.

Cr.=52.0

ACIDUM CHROMICUM.—Chromic Acid. CrO_3[=99.88. *Synonyms.*—Chromic Anhydride. Chromic Trioxide.]

Source.—Dissolve Potassium Dichromate in Sulphuric Acid and water, decant from the Acid Potassium Sulphate, heat with more Sulphuric Acid, cool and crystallize. $K_2Cr_2O_7+2H_2SO_4=2CrO_3+2KHSO_4+H_2O$.

Characters.—[Small needle-shaped crystals, or rhombic prisms, of a dark purplish-red color and metallic lustre. Readily yields Oxygen, and will, therefore, easily explode. It does so with either Glycerin, Ether, or Alcohol. *Solubility.*—Very soluble in water.]

Action.

External.—In consequence of its oxidizing power, chromic acid is a powerful deodorant and disinfectant. It coagulates

and bad ulcerations of the mouth. The I
which is 1 part of chromic acid in 3 of w
used as a caustic to destroy condylomata,
chromium are not given internally.

The remaining groups of the inorganic d

GROUP VIII.

Containing Phosphorus

PHOSPHORUS.

P. = 30.96.

SOURCE.—Treat Bone Ash or Lime Phosphate
water, filter and evaporate. $Ca_3(PO_4) + 2H_2SO_4 =$
Heat the Acid Calcium Phosphate thus formed, with C
forms Calcium Metaphosphate. $CaH_4(PO_4)_2 = Ca($
acted on by the Charcoal [and sand] thus: $2Ca($
$2CaSiO_3 + 10CO + P_4$.

CHARACTERS.—[A translucent, nearly colorless
having, at ordinary temperatures, about the consistenc
keeping the surface becomes red, and occasionally bla
and disagreeable odor and taste (but should not be ta
great dilution); when exposed to the air it emits whit
inous in the dark, and have an odor somewhat resemb
exposure to air it takes fire spontaneously. Heated wi
red, amorphous, non-poisonous Phosphorus.]

Dose, $\frac{1}{100}$ to $\frac{1}{20}$ gr.; [.0006 to .003 gm.] Ne

121° C., and filtered to remove water and organic matter, which would otherwise oxidize the Phosphorus) and Ether to 100. *Strength.*—1 per cent.]

Dose, 1 to 5 m.; .06 to .30 c.c.

2. **Pilulæ Phosphori.**—[Pills of Phosphorus. Dissolve Phosphorus, .06; Chloroform, 5; add Althæa, 6; and Acacia, 6 gm.; with water, and Glycerin; to make 100 pills.] *Strength.*—Each pill contains $\frac{1}{100}$ gr. [.0006 gm.] of Phosphorus.

Dose, 1 to 5 pills.

[3. **Spiritus Phosphori.**—Spirit of Phosphorus. *Synonym.*—Tincture of Phosphorus. Phosphorus, 1.2; absolute Alcohol to 1000. Dissolve by heating upon a water-bath.

Spirit of Phosphorus is used to prepare Elixir Phosphori.

Dose, 8 to 40 m.; .50 to 2.50 c.c.

4. **Elixir Phosphori.**—Elixir of Phosphorus. Spirit of Phosphorus, 210; Oil of Anise, 2; Glycerin, 550; Aromatic Elixir to 1000.

Dose, ½ to 2½ fl. dr.; 2. to 10. c.c.]

Action.

The action of minute doses of phosphorus is that in animals the spongy tissue in the long and short bones is thickened, and the compact tissue is rendered more dense. [It diminishes tissue waste, decreasing the elimination of urea and of carbon dioxide. As it is found as a necessary element in the nervous system its action is that of a stimulant to its growth.] Phosphorus enters the blood as phosphorus, and probably acts as such, not as phosphoric acid. *See* Toxicology.

Therapeutics.

It has been used in osteomalacia, in rickets, and in cases of ununited fracture; but for rickets at least it is a very inferior remedy. [It is of value in the convalescence from exhausting diseases, in nervous exhaustion, in neuralgia when dependent upon debility, in alcoholism, in sexual exhaustion and in various suppurative diseases.] It has been given in [many] diseases whose pathology is unknown, but without benefit.

Toxico

Acute Poisoning.—Phosphorus ...nistered criminally, either as match heads or vermin ... there are

...ing of ... symptoms are ... rectic and rapid. The urine is s... stained, and perhaps bloody, and it ... leucin and tyrosin. Muscular twitch ... and dies. *Post-mortem.*—Two resu... tion (thus Phosphorus resembles Ar... the liver, in which it is very marke... there may be a diminution in the ... also found in the muscles, kidneys ... rhages are seen in many places, and ... If they occur in the gastric and int... rise to the erroneous belief that ev... can be found at death. The sym... respects resemble those of acute yell...

Treatment.—Thoroughly empt... washing it out. [Formerly] Copper S... p. 169), three grains [.20 gm.] eve... every 15 minutes; also half a drachm... half hour. A full dose of a saline pu... of Potassium Permanganate has bee... any account be given. [Percy (Tu... old Oil of Turpentine which contai... the poison and before it was absorbe...

Chronic Poisoning.—This, ... among phosphorus fumes, is now o... of gastro-intestinal irritation and n...

no effects, then the following symptoms of gastro-intestinal irritation set in: Nausea, abdominal pain, and vomiting; the vomited matters smell of phosphorus and are luminous. There is some general depression. Diarrhœa is rare. The patient may die of collapse; but far more frequently these symptoms all pass off, and he appears quite well. But after three or four days jaundice is noticed, and this soon becomes very [marked]; there is now great prostration, the liver is enlarged, the abdomen distended, and he complains of intense thirst. Vomiting of altered blood and diarrhœa with bloody stools may be observed, but these two symptoms are not severe. The skin is cold, the pulse feeble and rapid. The urine is scanty, highly colored, albuminous, bile-stained, and perhaps bloody, and it may contain bile acids and crystals of leucin and tyrosin. Muscular twitchings occur, the patient becomes comatose and dies. *Post-mortem.*—Two results are very striking. (1) Fatty degeneration (thus Phosphorus resembles Arsenic and Antimony), affecting principally the liver, in which it is very marked; and, if the patient lives long enough, there may be a diminution in the size of the organ. Fatty degeneration is also found in the muscles, kidneys and gastro-intestinal tract. (2) Hæmorrhages are seen in many places, and ecchymoses are sometimes very abundant. If they occur in the gastric and intestinal mucous membranes, they may give rise to the erroneous belief that evidences of acute gastro-intestinal irritation can be found at death. The symptoms of Phosphorus poisoning in many respects resemble those of acute yellow atrophy of the liver.

Treatment.—Thoroughly empty the stomach by a stomach pump, or by washing it out. [Formerly] Copper Sulphate [was given] as an emetic (*see* Copper, p. 169), three grains [.20 gm.] every few minutes till vomiting is induced, then every 15 minutes; also half a drachm [2. c.c.] of Oil of Turpentine (*q. v.*) every half hour. A full dose of a saline purge may be administered. [Recently the use of Potassium Permanganate has been recommended.] No oils or fats should on any account be given. [Percy (Trans. Am. Med. Ass'n, 1872) found that the old Oil of Turpentine which contains oxygen, if administered soon after taking the poison and before it was absorbed, was an antidote (experiments upon dogs).]

Chronic Poisoning.—This, which used to be seen in those who worked among phosphorus fumes, is now of great rarity. The chief symptoms are those of gastro-intestinal irritation and necrosis of the jaw.

1. CALCII HYPOPHOSPHIS.—[Calcium Hypophosphite. $Ca(PH_2O_2)_2$=169.67.]

SOURCE.—Heat Phosphorus with Milk of Lime. Then pass Carbon Dioxide through the liquid to remove the excess of Lime. The Hypophosphite crystallizes out of the solution. $3Ca(OH)_2+4P_2+6H_2O=3Ca(PH_2O_2)_2$.

CHARACTERS.—[Colorless, transparent, monoclinic prisms or small lustrous scales, or a white, crystalline powder, having a nauseous, bitter taste. *Solubility*—In 6.8 parts of water; insoluble in Alcohol.]

Dose, 2 to 5 gr.; [.12 to .30 gm.]

2. SODII HYPOPHOSPHIS.—[Sodium Hypophosphite. $NaPH_2O_2 + H_2O = 105.84$.]

SOURCE.—Add Sodium Carbonate to a solution of Lime Hypophosphite and evaporate [the filtrate]. $Ca(PH_2O_2)_2 + Na_2CO_3 = CaCO_3 + 2NaPH_2O_2$.

CHARACTERS.—[Small, colorless, transparent, rectangular plates of a pearly lustre, or a white granular salt with a bitterish-sweet, saline taste. *Solubility.*—In 1 part of water; in 30 parts of Alcohol.]

Dose, 5 to 20 gr.; [.30 to 1.20 gm.]

3. [POTASSII HYPOPHOSPHIS.—Potassium Hypophosphite. $KPH_2O_2 = 103.91$.

SOURCE.—From double decomposition of Calcium Hypophosphite and Potassium Carbonate, the Potassium Hypophosphite remains in solution. $Ca(PH_2O_2)_2 + K_2CO_3 = CaCO_3 + 2KPH_2O_2$.

CHARACTERS.—White, opaque, hexagonal plates, or crystalline masses, or a granular powder, having a pungent, saline taste. *Solubility.*—In 0.6 part of water, and in 7.3 parts of Alcohol.

Dose, 5 to 20 gr.; .30 to 1.20 gm.

Preparations.

1. Syrupus Hypophosphitum.—Syrup of the Hypophosphites.

Calcium Hypophosphite, 45; Sodium Hypophosphite, 15; Potassium Hypophosphite, 15; diluted Hypophosphorous Acid, 2; Spirit of Lemon, 5; sugar, 500; and sufficient water to make 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

2. Syrupus Hypophosphitum cum Ferro.—Syrup of the Hypophosphites with Iron.

Ferrous Lactate, 10; Potassium Citrate, 10; Syrup of the Hypophosphites, to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

4. FERRI HYPOPHOSPHIS.—Ferric Hypophosphite. $Fe_2(PH_2O_2)_6 = 501.04$.

SOURCE.—A solution of Sodium Hypophosphite is added to a solution of Ferric Chloride, the precipitate is washed and dried with moderate heat. $6NaPH_2O_2 + 2FeCl_6 = Fe_2(PH_2O_2)_6 + 6NaCl$.

CHARACTERS.—A white or grayish-white powder, nearly tasteless. *Solubility.*—Only slightly soluble in water.

IMPURITIES.—All of the Hypophosphites are liable to be contaminated with the alkaline carbonates or to contain free alkali.

Dose, 2 to 10 gr.; .12 to .60 gm.

5. ZINCI PHOSPHIDUM.—Zinc Phosphide. $Zn_3P_2 = 257.22$.

SOURCE.—From vapor of Phosphorus in a current of dry Hydrogen over heated Zinc, after all atmospheric air is expelled.

CHARACTERS.—A gritty powder of a dark-gray color, or crystalline fragments of a dark metallic lustre, and having a faint odor and taste of phosphorus.

Dose, $\frac{1}{10}$ to $\frac{1}{3}$ gr.; .006 to .02 gm.

6. [ACIDUM HYPOPHOSPHOROSUM DILUTUM.—Diluted Hypophosphorous Acid. A liquid composed of about 10 per cent., by weight, of absolute Hypophosphorous Acid (HPH_2O_2=65.88) and about 90 per cent. of water.

SOURCE.—Decompose Potassium Hypophosphite by Sulphuric Acid, filter and evaporate to a syrupy consistence. $2KPH_2O_2 + H_2SO_4 = K_2SO_4 + 2HPH_2O_2$.

CHARACTERS.—A colorless liquid, without odor, and having an Acid taste. Sp. gr. about 1.046. *Solubility.*—Miscible in all proportions, with water.

Diluted Hypophosphorous Acid is used in Syrupus Hypophosphitum.]

THE THERAPEUTICS OF FERRIC, CALCIUM, SODIUM, AND POTASSIUM HYPOPHOSPHITES.

These drugs have been recommended for phthisis. Although in many cases there is no satisfactory evidence of their value, yet they are extensively used and are the basis of a large number of proprietary preparations.

[Following Churchill they should be of chemical purity, neutral in reaction; the presence of free alkali or alkaline carbonates quickly giving rise to an atonic dyspepsia. The preparation, the syrup of the hypophosphites is faulty in that each salt has a peculiar property, yet the final result being due to the hypophosphite, and its beneficial effect upon nutrition. In the early stages of phthisis (infiltration) the sodium salt should be administered and the sodium salt alone; if excavation is present the calcium salt is indicated, and that alone, provided that it does not too suddenly check expectoration, when the sodium salt should be resumed.

The potassium s lt is a valuable expectorant in chronic bronchitis; but it has a very limited usefulness in phthisis. The hypophosphites, when administered intelligently, will improve nutrition and relieve some of the symptoms of phthisis. If administered in too large doses, or simultaneously with other remedies, as arsenic, stimulants, strychnine, cod-liver oil, they are likely to

produce headaches, dyspepsia, and fail to cause improvement. The objection to the Syrup, U. S. P, namely, the use of the salts in combination, applies to nearly all of the proprietary preparations, most of which contain impure drugs and are not scientific combinations. The Syrup of the Hypophosphites with Iron is valuable as a reconstructive. Zinc phosphide is believed to have the same physiological and therapeutical effects as phosphorus.]

GROUP IX.

Chlorine, Iodine, Bromine.

These elements, which are chemically so closely allied, are all of them powerful disinfectants and irritants.

I. CHLORUM.

[**CHLORUM.**—Chlorine. Cl. = 35.37.]

This gas is not official under its own name, but is officially obtained from two sources of it, viz., Hydrochloric Acid and Chlorinated Lime.

1. **AQUA CHLORI.**—[Chlorine water. An aqueous solution of Chlorine (Cl = 35.37) containing at least 0.4 per cent. of the gas.]

SOURCE.—Pass washed Chlorine gas into water. The gas is obtained by heating diluted Hydrochloric Acid, 35; and Manganese Dioxide, 10. $4HCl + MnO_2 = Cl_2 + MnCl_2 + 2H_2O$.

CHARACTERS.—[A clear greenish-yellow liquid, having the suffocating odor and disagreeable taste of Chlorine.]

INCOMPATIBLES.—Lead and silver salts.

[*Free Chlorine is contained in* Acidum Nitrohydrochloricum Dilutum.]

Dose, 1 to 4 fl. dr.; [4. to 15 c.c.] diluted with water.

2. **CALX CHLORATA.**—Chlorinated Lime. [A compound resulting from the action of Chlorine upon Calcium Hydrate, and containing not less than 35 per cent. of available Chlorine.] *Synonym.*—Bleaching powder. It may be regarded either as a compound of Calcium Hypochlorite and Chloride, or as one of Lime and Chlorine.

SOURCE.—Pass Chlorine gas over slaked Lime. $2Ca(OH)_2 + 2Cl_2 = CaCl_2O_2CaCl_2 + 2H_2O$.

CHARACTERS.—A white or grayish-white granular powder, [exhaling the odor of Hypochlorous Acid, having a repulsive, saline taste, and becoming moist and gradually decomposing on exposure to air.]

3. **LIQUOR SODÆ CHLORATÆ.**—[Solution of Chlorinated Soda. NaCl,NaClO. *Synonym.*—Labarraque's solution. An aqueous solution of several Chlorine compounds of Sodium, containing at least 2.6 per cent., by weight, of available Chlorine.]

SOURCE.—[A solution of Sodium Carbonate, 150; Chlorinated Lime, 75; in water to 1000.

CHARACTERS.—A clear, pale-greenish liquid, having a faint odor of Chlorine. Sp. gr. about 1.052.]

Dose, ½ to 1 fl. dr; [2. to 4 c.c.]

ACTION OF CHLORINE.

External.—Chlorine is one of the most powerful **disinfectants** and **deodorizers**. It has a very great affinity for hydrogen, and hence decomposes compounds which contain hydrogen, oxygen generally being set free. Chlorine is a very active and destructive **irritant** to the skin and mucous membranes.

Internal.—It is hardly ever given internally. If it were, it would become converted into chlorides, [but the odor of Chlorine has been found in the brain after death from its inhalation (Cameron)].

THERAPEUTICS OF CHLORINE.

External.—Chlorine is largely used in the form of chlorinated lime to disinfect privies, drains, urinals, etc. It may be employed also to disinfect rooms after infectious diseases. All metals or articles such as fabrics, likely to be bleached, should be covered up or removed; the windows and chimneys should be pasted up. The gas can be evolved from common salt, manganese dioxide, and sulphuric acid. The door is then shut, and the cracks around it are pasted over with paper. Chlorine water is sometimes employed as a wash for foul ulcers and discharges.

Internal.—Chlorine is used internally in the form of a wash for the mouth. The vapor gives rise to great irritation of the respiratory tract, and should never be inhaled. [Aqua Chlori has been successfully used, well diluted, in the diarrhœa of typhoid fever.]

II. IODUM.

IODUM.—Iodine. I = 126.53.

SOURCE.—Obtained from the ashes of sea-weed [and from the mother-liquor of Chilian Sodium Nitrate.

CHARACTERS.—Heavy bluish-black, dry and friable rhombic plates, having a metallic lustre, a distinctive odor, and a sharp and acrid taste. *Solubility.*—In 5000 parts of water; in 10 parts of Alcohol, freely in Ether, slightly in Glycerin, freely in a solution of Potassium Iodide or Sodium Chloride.]

INCOMPATIBLES.—Ammonia, metallic salts, mineral acids, and alkaloids.

IMPURITIES.—Iodine cyanide, and iron.

Preparations.

[1. **Liquor Iodi Compositus.**—Compound Solution of Iodine. *Synonym.*—Lugol's Solution. Iodine, 5; Potassium Iodide, 10; water to 100. *Strength.*—5 per cent.]

Dose, 1 to 10 m.; [.06 to .60 c.c.]

2. **Tinctura Iodi.**—[Tincture of Iodine. Iodine, 70; Alcohol to 1000. *Strength.*—7 per cent.

Dose, 1 to 5 m.; .06 to .30 c.c.]

3. **Unguentum Iodi.**—[Iodine Ointment. Iodine, 4; Potassium Iodide, 1; water, 2; Benzoinated Lard, 93. *Strength.*—4 per cent.].

ACTION OF IODINE.

External.—The actions of iodine applied externally are the same as those of chlorine, that is to say, it is powerfully **disinfectant and irritant.** The latter action is the most important. Iodine applied to the skin produces a yellow stain, which can be removed by an alkali or sodium hyposulphite. At the same time it causes a sensation of heat and burning, dilatation of the vessels (rubefaction), and some œdematous swelling. Preparations of iodine are rarely used strong enough to produce more powerful irritation than this. The external application of them probably reflexly dilates the vessels of the subjacent organs, and this may explain their use as counter-irritants. If they are too strong, the irritation set up by them will proceed to the formation of vesicles, and even pustules, and deep inflammation with scarring. They usually destroy the superficial cuticle, so that after the use of them the skin peels. They are **parasiticides** to the various vegetable and animal parasites which infest the skin.

Internal.—Iodine, when taken internally, is converted into

an iodide. Minute doses of the tincture occasionally stop vomiting. The vapor is very irritating to the respiratory passages.

Therapeutics of Iodine.

External.—Iodine is rarely employed for its antiseptic properties, as chlorine is cheaper. The preparations of iodine are in constant use as irritants and counter-irritants. Usually one or two coats of the liniment [B. P. which contains iodine, 5; potassium iodide, 2; glycerine, 1; alcohol, 40], lightly painted on the skin, suffice; if more is used the inflammation is too severe. If it causes pain, it may be washed off with a solution of potassium iodide. The ointment, tincture and compound solution are much milder than the liniment. Preparations of iodine are frequently used as counter-irritants for chronic inflammation of joints, for pleurisy, chilblains, periostitis, and many other purposes. The mild preparations of iodine are applied over chronically inflamed lymphatic glands when the cause of the swelling cannot be removed. A decolorized tincture of iodine is prepared, consisting of iodine dissolved in alcohol, and decolorized by a strong solution of ammonia. Its strength is 1 in 40, nearly, and has the advantage of not staining the skin; but it contains no iodine, for ammonium iodide and iodate are formed. Therefore it is a much milder irritant than other iodine preparations. Any effect it may have is due to excess of ammonia. For its irritant effect the official tincture may be injected into a hydrocæle or a cyst to cause adhesive inflammation, and it has been injected into joints, abscesses, and the pleural cavity after empyema; but in such cases great care must be taken that the inflammation induced is not too severe, and this treatment is now very rarely used, for the cavities, being kept antiseptic, heal up without it. The tincture, or, if it can be borne, the liquor, is often used as an antiparasitic for ringworm. Coster's paste, which is sometimes employed for this disease, consists of iodine dissolved in light oil of wood tar (1 to 4). Morton's fluid, which is used as an injection for spina bifida, consists of iodine, 1; potassium iodide, 3; glycerin, 48.

Internal.—The vapor of iodine is occasionally inhaled for diseases of the lungs; but it probably does more harm than good. One or two minims, [.06 to .12 c.c.] of the tincture in half an ounce, [15. c.c.] of water are often given, quite empirically, every half hour, in cases of vomiting, and sometimes with distinct benefit.

1. **POTASSII IODIDUM.**—[Potassium Iodide. KI=165.56.]

SOURCE.—Dissolve Iodine in a hot solution of Potassa in distilled water. $3I_2 + 6KHO = 5KI + KIO_3 + 3H_2O$. Evaporate and heat the residue with Charcoal; the Oxygen of the Iodate is carried off as Carbon Dioxide. $KIO_3 + C_3 = KI + 3CO$. Dissolve in boiling water, filter, wash and crystallize.

CHARACTERS.—[Colorless, transparent or translucent, cubical crystals, or a white, granular powder, having a peculiar, faint, iodine-like odor, and a pungent, saline, afterwards bitter taste. *Solubility.*—In 0.75 part of water; in 18 of Alcohol; in 2.5 of Glycerin.]

INCOMPATIBLES.—Bismuth subnitrate, sweet spirits of nitre, liquorice, and preparations containing starch.

IMPURITIES.—Iodates and free alkalies.

Dose, 5 to 60 gr.; [.30 to 4.00 gm.,] or more.

Preparations.

[1. **Syrupus Acidi Hydriodici.**—Syrup of Hydriodic Acid. A syrupy liquid containing about 1 per cent., by weight, of absolute Hydriodic Acid (HI=127.53).

SOURCE.—Dissolve Potassium Iodide, 13; and Potassium Hypophosphite, 1; in water. Dissolve Tartaric Acid, 12; in diluted Alcohol, 25; mix the two solutions, cool, filter, reduce the filtrate by evaporation to 50 parts, and mix when cold, with Syrup to 1000.

CHARACTERS.—A transparent, colorless or not more than a pale straw-colored liquid, having a sweet and acidulous taste and an acid reaction. Sp. gr., about 1.313.

Dose, ½ to 1 fl. dr.; 1. to 4. c.c.]

2. **Unguentum Potassii Iodidi.**—[Ointment of Potassium Iodide. Potassium Iodide, 12; Sodium Hyposulphite, 1; hot water, 10; Benzoinated Lard, 77.]

2. **SODII IODIDUM.**—Sodium Iodide. NaI[=149.53].

SOURCE.—Made from a solution of Soda, as Potassium Iodide is made from a solution of potash. $3I_2 + 6NaHO = 5NaI + NaIO_3 + 3H_2O$.

CHARACTERS.—[Colorless, cubical crystals or a white crystalline powder,

having a saline and slightly bitter taste. *Solubility.*—In 0.6 part of water; in about 3 parts of Alcohol.]

Dose, 5 to 30 gr.; [.30 to 2.00 gm.,] or more.

[3. **AMMONII IODIDUM.**—Ammonium Iodide. $NH_4I = 144.54$.

SOURCE.—Dissolve Potassium Iodide and Ammonium Sulphate in boiling water, add Alcohol, filter, wash, and evaporate the filtrate to dryness. $2KI + (NH_4)_2SO_4 = 2NH_4I + K_2SO_4$.

CHARACTERS.—Minute, colorless, cubical crystals, or a white granular powder, very deliquescent, having a sharp, saline taste. *Solubility.*—In 1 part of water, and in 9 parts of Alcohol.

IMPURITIES.—Iodates and potassium sulphate.

Dose, 2 to 10 gr.; .12 to .60 gm., or more.

4. **STRONTII IODIDUM.**—Strontium Iodide. $SrI_2 + 6H_2O = 448.12$.

SOURCE.—By neutralization of freshly prepared solution of Hydriodic Acid with Strontium Carbonate; the filtrate is concentrated and the salt obtained by crystallization. $2HI + SrCO_3 = SrI_2 + CO_2 + H_2O$.

CHARACTERS.—Colorless, transparent, hexagonal plates, odorless, and having a bitterish, saline taste. Deliquescent, and colored yellow by exposure to air and light. *Solubility.*—In 0.6 part of water; soluble in Alcohol, and slightly in Ether.

IMPURITY.—Barium salts.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

5. **ZINCI IODIDUM.**—Zinc Iodide. $ZnI_2 = 318.16$.

SOURCE.—By digesting an excess of Zinc, with Iodine diffused in water. $Zn + I_2 + H_2O = ZnI_2 + H_2O$.

CHARACTERS.—A white, granular powder, odorless, and having a sharp, saline and metallic taste. Very deliquescent, and liable to absorb oxygen from the air, and to become brown from liberated Iodine. *Solubility.*—Readily in water, Alcohol, or Ether.

Dose, 1 to 3 gr.; .06 to .20 gm.]

ACTION OF POTASSIUM, SODIUM, [AMMONIUM, STRONTIUM AND ZINC IODIDES.]

External.—They have none. They do not irritate, nor are they absorbed by the unbroken skin.

Internal.—It is often taught that iodine (which is supposed to be converted into sodium iodide in the alimentary canal) and potassium iodide (which also becomes sodium iodide), both have

the same internal action; but free iodine is much more irritant to the gastro-intestinal tract than either the potassium or the sodium salt, and it is said to produce sexual excitement; but iodides have not this action. Therapeutically considered, the sodium, [ammonium, potassium and strontium iodides], also produce entirely different results from iodine. It is not known how they act, nor even in what form they are absorbed. They have in certain diseases a profound effect on nutrition, and it is said that they cause an increased elimination of uric acid. Occasionally considerable general depression is produced by large doses of potassium iodide; but this is probably due to the potassium, and not to the iodine, [and in this case the syrup of hydriodic acid can be substituted]. The form in which iodides are eliminated is not known; but when they are taken in excess, a series of symptoms, due no doubt to their elimination by the skin and mucous membranes, takes place. They are frequently seen in patients taking iodides, and they are known as Iodism.

Iodism.—The patient complains of heavy pain over the frontal sinus, running at the nose, sore throat, increased secretion of saliva, and an eruption on the skin, consisting of patches of erythema. The inflammation about the fauces may spread to the gums or down the trachea, setting up laryngitis, tracheitis, and bronchitis. The susceptibility of people to poisoning by iodides varies very much.

Therapeutics of Potassium, Sodium, [Ammonium, Strontium and Zinc] Iodides.

The most important use of iodides is for syphilis; their value for the primary and secondary stages is comparatively slight, but they are invaluable for the tertiary stages, as they often cause the rapid absorption of nodes, gummata and other syphilitic deposits. The pharmacopœial dose may often be exceeded: patients sometimes take two, three, or even four drachms [8. to 16. gm.] a day. Large doses are especially used in syphilis of the nervous system.

Chronic rheumatoid arthritis is often treated, and sometimes with benefit, by small doses of potassium iodide continued for a

long while, but probably ferrous iodide is more useful. Gonorrhœal rheumatism is often treated with potassium iodide; [but the syrup of hydriodic acid is preferable]. It frequently aids the absorption of chronic inflammatory products, even when they are not syphilitic. Therefore certain forms of joint disease, of pleurisy and of pulmonic consolidation sometimes yield to treatment by this drug. The attempt has been made to cure aneurisms which are inaccessible to surgery by giving potassium iodide for long periods, for it is thought that it aids the coagulation of blood in them; but as at the same time the patient is always kept in bed, it is difficult to say how much of any improvment that may happen to take place is due to the iodide. It is a valuable expectorant, particularly the ammonium salt, and sometimes cures cases of bronchitis when other remedies have failed. Lately, chronic Bright's disease has been largely treated with this drug. Lardaceous disease of the kidneys and other organs is benefited by it. The potassium salt is recommended for asthma, and in some cases does much good. It is occasionally given to decrease the secretion of milk.

Potassium iodide causes an increased excretion of both lead and mercury if they exist in the body, and it is therefore of great value in cases of chronic poisoning by these metals. Sodium iodide is not so much used, but it probably produces the same effects as the potassium salts, but does not cause so much depression.

[Strontium iodide has been recently introduced, and is used for the same purposes as the other iodides. It is believed that it is less likely to disturb the stomach, cause acne, and depress the heart than the remaining iodides. In many instances the syrup of hydriodic acid can be substituted with advantage for the iodides. It is not so likely to produce iodism, nor does it so readily give rise to the "iodide pimishment." Its pleasant taste is grateful to most patients; it should, however, be administered well diluted one-half hour before meals, or at least upon an empty stomach. Some of the commercial preparations are likely to readily decompose, especially when made from tartaric acid and

potassium iodide, and are objectionable from the amount of syrup which is administered when large doses are employed.]

III. BROMUM.

BROMUM.—Bromine. Br. = [79.76.]

SOURCE.—[A liquid] obtained from sea water and saline springs.

CHARACTERS.—[A heavy, dark, brownish red, mobile liquid, evolving, even at ordinary temperatures, a yellowish-red vapor, highly irritating to the eyes and lungs, and having a peculiar suffocating odor, resembling that of Chlorine. Sp. gr., 2.990.] *Solubility.*—In 30 parts of water; readily in Alcohol and Ether.

IMPURITY.—Iodine.

ACTION.

Its action is like that of chlorine and iodine. It is rarely used in medicine.

1. **POTASSII BROMIDUM.**—Potassium Bromide. KBr[=118.79].

SOURCE.—[By adding Bromine to a solution of Potassa, a solution of the Bromide and Bromate is made. $3Br_2+6KOH=5KBr+KBrO_3+3H_2O$. On evaporation to dryness, mixing the salts with Charcoal and heating to redness, the Bromate is reduced to a Bromide, while the Oxygen unites with the Carbon, forming Carbon Dioxide, which escapes. $KBrO_3+C_3=KBr+3CO_2$. Dissolving in water, the solution yields the Bromide in crystals.

CHARACTERS.—Colorless or white cubic crystals, or granules, having a pungent saline taste. *Solubility.*—In about 1.6 parts water; in 200 parts of Alcohol.

IMPURITIES.—Potassium bromide and free alkali.]

INCOMPATIBLES.—Acids, acid and metallic salts.

Dose, 5 to 60 gr.; [.30 to 4.00 gm.]

2. **SODII BROMIDUM**—Sodium Bromide. NaBr[=102.76.]

SOURCE.—Made from a solution of Soda, as Potassium Bromide is made from a solution of Potassa.

CHARACTERS.—[Colorless or white cubical crystals, or a white granular powder, having a saline, slightly bitter taste. *Solubility.*—In about 1.2 parts of water; in 13 parts of Alcohol.]

INCOMPATIBLES.—Those of Potassium Bromide.

Dose, 15 to 60 gr.; [1. to 4. gm.]

3. **AMMONII BROMIDUM.**—Ammonium Bromide. NH_4Br[= 97.77.]

SOURCE.—Made by neutralizing Hydrobromic Acid with Ammonia or

long while, but probably ferrous iodide is more useful. Gonorrhœal rheumatism is often treated with potassium iodide; [but the syrup of hydriodic acid is preferable]. It frequently aids the absorption of chronic inflammatory products, even when they are not syphilitic. Therefore certain forms of joint disease, of pleurisy and of pulmonic consolidation sometimes yield to treatment by this drug. The att[illegible]nade to cure aneurisms which are inaccessible to [illegible]g potassium iodide for long periods, for it is tho[illegible] the coagulation of blood in them; but as at the [illegible]atient is always kept in bed it is difficult to say h[illegible]nprovment that may happen to take place is due t[illegible]t is a valuable expectorant, particularly the amm[illegible] sometimes cures cases of bronchitis when oth[illegible]: failed. Lately, chronic Bright's disease has b[illegible]d with this drug. Lardaceous disease of the k[illegible]r organs is benefited by it. The potassium salt is re[illegible] asthma, and in some cases does much good. It is occasionally given to decrease the secretion of milk.

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of urine is increased, [particularly after the use of the lithium salt]; the coloring matters, the sulphur, and the nitrogen in it are increased; but the phosphorus is decreased.

Sexual organs.—If bromides are taken for a long time a failure of sexual vigor is produced, and ultimately there is a great lessening of the sexual appetite. Bromides are therefore anaphrodisiacs.

Elimination.—Bromides are rapidly eliminated by the kidneys, skin, saliva, intestinal mucous membrane, bronchial mucous membrane, and in milk.

Bromism.—If bromides are taken for too long a period, a series of symptoms of poisoning, to which the above name has been given, may appear. [The hydrobromic acid, although containing a larger proportion of bromine, rarely gives rise to bromism.] The earliest of them is a rash, consisting of red papules, chiefly on the face and back, exactly resembling some forms of acne. This is probably the result of the excretion of bromide by the skin. The next symptoms are a general lowering of the cutaneous sensibility and also of that of the pharynx, then there is diminution of sexual power, the patient becomes low-spirited, easily fatigued, unfit for work, and his intellect is dulled. There may be a little conjunctivitis, and some increased secretion from the bronchi.

Potassium bromide owes its action largely to the bromine in it, but probably also, to a less extent, to the potassium. In man, at least, the higher functions of the brain are depressed before the lower, and these again before the spinal. Thus the depression takes place in regular order from above downwards, in the reverse order of the physiological development of the functions, and this is commonly the case with many drugs (*see* Law of Dissolution, p. 99).

Those who take bromides habitually find themselves unable to sleep without them, and their intellect becomes obscured. These bad effects are intensified by the fact that gradually larger doses are required to produce sleep, and thus the unfortunate sufferer becomes more and more a slave to the drug.

Therapeutics of the Bromides.

External.—None.

Internal.—*Alimentary canal.*—Formerly the back of the throat was painted with a solution of a bromide before a laryngeal examination, but now cocaine is employed for this purpose.

Nervous system.—Because of their depressing effect bromides are largely used for many nervous diseases. They are the most valuable drugs we have for the treatment of epilepsy, acting no doubt by diminishing the excitability of the cerebral cortex. They rarely cure, but often greatly diminish the number of fits. It is impossible to say in any given case whether bromides will do good, therefore they [should] be tried in all; *petit mal* is more difficult to influence than *grand mal*. The next most common use of bromides is as hypnotics. They are most useful when there is no organic cause to explain the insomnia, and therefore they are not employed when pain keeps the patient awake, but are given with great benefit in the insomnia of overwork, worry, or that connected with the climacteric period. The sleep induced is quiet and refreshing, without dreams, and therefore these drugs are of great value in nightmare, and in the night-screaming of children, which may be regarded as allied to it. Also because of their depressant effect on the nervous system they are given in migraine, and often they are the only drugs which do any good for the intense headache of this disease. Large doses, often a drachm [4. gm.] at a time, are given in delirium tremens, especially in combination with chloral, and sometimes the patient seems quieter for this treatment. Not only the insomnia, but the other nervous symptoms that are common at the climacteric period may be relieved by bromides For their depressing power on centres below the cortex they are used, and with good results, in laryngismus stridulus, and have been given in whooping-cough; but the benefit is not marked. Some cases of tetanus have recovered after enormous doses of bromides. Here their value is, no doubt, due to their power of diminishing the reflex function of the spinal cord. Bromides have been given as antidotes for

SOURCE.—Potassium Bromide in solution is mix
and the Potassium Sulphate allowed to crystallize,
upon the filter and the filtrate is distilled nearly to d
to the proper strength. $2KBr+H_2SO_4=2HBr]+K_2$

CHARACTERS.—A clear, colorless liquid, havin
Sp. gr., about 1.077.

Dose, ½ to 1 fl. dr.; [2. to 4. c.c.].

ACTION AND THERAPEUTI

The action of this acid appears to be the
bromides of the alkaline metals, but it is ver
same purposes. It has been employed with
relieve noises in the ears, and it is said to pr
of poisoning by quinine; [of this drug it is a

GROUP X.

Containing **Sulphur** only

SULPHUR.

S=31.98.

Sulphur is official in three form

1. **SULPHUR SUBLIMATUM.**—Sublimed
Flowers of Sulphur.

Preparations.

1. **Sulphur Præcipitatum.**—Precipitated Sulphur. *Synonyms.*—Milk of Sulphur. Lac Sulphur.

SOURCE.—Boil Sublimed Sulphur, 100; with Slaked Lime, 50; in water. $6S_2 + 3Ca(OH)_2 = 2CaS_5 + CaS_2O_3 + 3H_2O$. This gives a solution containing Calcium Sulphide and Calcium Hyposulphite. To it Hydrochloric Acid is added, and Sulphur is thrown down as a very fine precipitate. $2CaS_5 + 4HCl = 2CaCl_2 + 4S_2 + 2H_2S$. Wash and dry the precipitate.

CHARACTERS.—[A fine, amorphous powder of a pale yellow color, without odor or taste.]

IMPURITY.—Lime sulphate, which makes it gritty.

Dose, 15 to 60 gr.; [1. to 4. gm.]

[2. **Sulphur Lotum.**—Washed Sulphur.

SOURCE.—Sublimed Sulphur, 100; with water, 100; and Ammonia Water, 10; is digested, filtered, drained and dried.

CHARACTERS.—A fine, yellow powder, without odor or taste. *Solubility.*—Insoluble in water.

IMPURITIES.—Acids, arsenous acid, and arsenous sulphide.

Washed Sulphur is contained in Pulvis Glycyrrhizæ Compositus, *and is used to make* Sulphuris Iodidum.

Dose, 15 to 60 gr.; 1. to 4. gm.

3. **Unguentum Sulphuris.**—Sulphur Ointment. Washed Sulphur, 300; Benzoinated Lard, 700.]

ACTION OF SULPHUR.

External.—Sulphur itself has no action on the skin, but some of it is converted into hydrogen [sulphide], and that is a mild vascular stimulant, causing slight dilatation of the vessels, and in some persons eczema. It kills the *Sarcoptes* [*scabiei*], and is therefore a **parasiticide.**

Internal.—*Alimentary canal.*—It has no effect on the stomach, and most that is taken is passed out in the fæces unaltered. A certain amount is, in the intestine, converted into hydrogen [sulphide] and other sulphides. These cause a **mild laxative** effect, increasing the secretion of intestinal juice, and slightly stimulating the muscular coat, producing soft semi-liquid stools, sometimes accompanied by flatus of hydrogen [sulphide], which, if in sufficient quantity, makes sulphur an undesirable laxative.

Remote effects.—Sulphur is absorbed as sulphides and hydrogen [sulphide], which is a powerful poison, decomposing the blood, and thus producing symptoms of asphyxia. It also paralyzes the whole nervous and muscular systems, but sulphur is never given to man in sufficient doses to produce any remote effects. Patients taking sulphur get rid of some minute portion of it as hydrogen [sulphide] through the kidneys, the milk, the lungs, and skin. The breath occasionally smells of it, and silver ornaments next to the skin may be discolored.

Therapeutics of Sulphur.

External.—Sulphur is commonly used to kill the *Sarcoptes* [*scabiei*], and thus to cure scabies. The skin should be well scrubbed with soft soap and hot water to lay open the burrows. Then it is thoroughly rubbed with the ointment. The patient should do this before bedtime, sleep in flannel, and wash the ointment off the next morning. This proceeding repeated three or four times will generally cure the disease. Sulphur ointment was formerly applied as a stimulant to ulcers, and was rubbed in for chronic rheumatism; but these modes of treatment are now rarely used, and their value is doubtful. [Mineral waters containing sulphur are useful for chronic rheumatism, as, for example, those of Richfield Springs.] Mild sulphur preparations are applied for acne.

Internal.—*Alimentary canal.*—Sulphur is a very good laxative, especially for children; as it produces a soft motion, but no pain, it is useful for cases of piles or fissure of the anus. Washed sulphur is contained in compound liquorice powder, which is an excellent and popular laxative. One or two sulphur lozenges [of the B. P., each containing 5 gr. [.30 gm.] of precipitated sulphur and 1 gr. [.06 gm.] of acid potassium tartrate], taken at bedtime often secure an easy evacuation of the bowels the next morning, in persons liable to slight constipation. These lozenges have been recommended for constipation associated with hepatic disease.

Remote effects.—Sulphur has been administered internally for all sorts of skin diseases, generally without any good result, but

occasionally chronic eczema associated with much itching appears to be benefited by it, so that the sulphur lozenge is a suitable laxative for these cases. Sulphur has been also given for bronchitis, for chronic rheumatism, and rheumatic myalgia, but it is very doubtful whether in these diseases there is much relief from this treatment.

2. **POTASSA SULPHURATA.**—Sulphurated Potassa. *Synonym.*—Liver of Sulphur. A mixture consisting for the most part of Potassium Hyposulphite ($K_2S_2O_3$) and Sulphide K_2S_5.

SOURCE.—Heat in a crucible a mixture of Sublimed Sulphur, 100; and dried Potassium Carbonate, 200. [$3K_2CO_3 + 4S_2 = K_2S_2O_3 + 2K_2S_3 + 3CO_2$.]

CHARACTERS.—[When freshly prepared it forms irregular pieces of a liver-brown color, which, by exposure to the air, gradually absorb moisture, Oxygen, and Carbon Dioxide, and change to a greenish-yellow and finally a gray mass, containing Potassium Carbonate, Hyposulphite and Sulphate. The compound has a faint odor of Hydrogen Sulphide, and a bitter, alkaline taste. *Solubility.*—In 2 parts of water.]

3. **CALX SULPHURATA.**—[Sulphurated Lime. *Synonym.*—Crude Calcium Sulphide. A mixture containing at least 60 per cent. of Calcium Monosulphide ($CaS = 71.89$), together with unchanged Calcium Sulphate ($CaSO_4 = 135.73$), and Carbon, in varying proportions.

SOURCE.—Obtained by heating a mixture of Calcium Sulphate, 70; Charcoal, 10; and Starch, 2.

CHARACTERS.—A pale gray powder, exhaling a faint odor of Hydrogen Sulphide, having a nauseous, alkaline taste, and gradually decomposed by exposure to air. *Solubility.*—Very slightly in water; insoluble in alcohol.]

Dose, $\frac{1}{10}$ to $\frac{1}{2}$ gr.; [.006 to .03 gm.]

4. **SULPHURIS IODIDUM.**—Sulphur Iodide. SI[= 158.51.

SOURCE.—By heating washed Sulphur, 120; with Iodine, 80, to liquefaction; when solid after cooling, reduce the fused mass to pieces.

CHARACTERS.—Brittle masses of a crystalline fracture and a grayish or black, metallic lustre, having the odor of Iodine, and a somewhat acrid taste.] *Solubility.*—[Almost] insoluble in water.

Dose, 1 to 4 gr.; [.06 to .24 gm.]

ACTION OF SULPHURATED POTASH, SULPHURATED LIME, AND SULPHUR IODIDE.

External.—These preparations are irritant, and are powerful **parasiticides** for the *Sarcoptes* [*scabiei.*]

Internal.—Nothing is known of their internal action.

Therapeutics of Sulphurated Potash, Sulphurated Lime, and Sulphur Iodide.

External.—The sulphurated potash ointment [B. P.—Sulphurated potash, 5; hard paraffin, 18; soft paraffin, 55;] is often used [to cure scabies] in the same way as sulphur ointment. [These] drugs have been used for many chronic skin diseases; but now they are not often employed. They appear, however, occasionally to do good in cases of acne indurata. Baths containing sulphides in solution are considered by many to be very useful for chronic rheumatic arthritis and rheumatic myalgia. The famous natural sulphide baths are those of Aix-la-Chapelle, Aix-les-Bains, and there are many others, which will be found described in works on general therapeutics; but as in all of them the water is warm, and warm water is beneficial for chronic rheumatism, and the sulphides exist in infinitesimally small quantities, it is very probable that the benefit is due more to the heat of the water than to its constituents.

Internal.—Sulphides have been given for chronic rheumatism, various skin diseases, and phthisis; but the evidence of good done is scanty. Sulphurated lime has been given internally in cases of suppuration, but it probably has no influence on the process.

GROUP XI.

Acids.

Those acids which will be considered here may be divided into two classes.

First, those which are strongly acid, the more powerfully acid being active caustics. They are **Sulphuric, Nitric, Hydrochloric, Nitrohydrochloric, Phosphoric, Acetic, Tartaric, Citric** and **Lactic** acids. **Hydrobromic, Hydriodic** [and **Hypophosphorous**] acids might be placed here, but they have already been considered (*see* pp. 232, 223 and 218).

Second, those which, although feebly acid, are powerfully antiseptic. They are **Sulphurous** and **Boric** acids.

Diluted Hydrocyanic, Carbolic, Benzoic, Gallic, Tannic, Oleic and Salicylic acids are not used as acids, and will be considered under other headings.

Arsenous Acid and Chromic Acid are not true acids; they are Anhydrides, and have already been considered (*see* 203 and 213).

CLASS I.

1. **ACIDUM SULPHURICUM.**—[Sulphuric Acid. A liquid composed of not less than 92.5 per cent. by weight, of absolute Sulphuric Acid (H_2SO_4=97.82) and 7.5 per cent. of water.]

SOURCE.—Produced by the combustion of Sulphur or Iron Pyrites, and the oxidation and hydration of the resulting Sulphur Dioxide gas by means of nitrous and aqueous vapors. [$2HNO_3+2SO_2+H_2O=2H_2SO_4+N_2O_3$. $N_2O_3+2SO_2+O_2+H_2O=2SO_2,OHNO_2$. $2SO_2,OHNO_2+H_2O=2H_2SO_4+N_2O_3$.

CHARACTERS.—A colorless liquid of oily consistence and very caustic and corrosive. Sp. gr., not below 1.835.]

IMPURITIES.—Nitric acid, lead, and arsenic.

INCOMPATIBLES.—Alkalies, their carbonates, lead and calcium salts.

Preparations.

1. **Acidum Sulphuricum Dilutum.**—[Diluted Sulphuric Acid. Sulphuric Acid, 100; distilled water, 825. Sp. gr., about 1.070. Contains 10 per cent., by weight, of absolute Sulphuric Acid.]

Dose, 10 to 30 m.; [.60 to 2.00 c.c.]

2. **Acidum Sulphuricum Aromaticum.**—[Aromatic Sulphuric Acid. Sulphuric Acid, 100; Oil of Cinnamon, 1; Tincture of Ginger, 50; Alcohol, a sufficient quantity to make 1000. Sp. gr., about 0.939. Contains about 20 per cent. by weight of official Sulphuric Acid, partly in form of Ethyl-Sulphuric Acid.]

Aromatic Sulphuric Acid is contained in Infusum Cinchonæ.

Dose, 5 to 15 m.; [.30 to 1.00 c.c.]

2. **ACIDUM NITRICUM.**—Nitric Acid. [A liquid composed of 68 per cent. by weight of absolute Nitric Acid (HNO_3=62.89), and 32 per cent. of water.]

SOURCE.—Made from Potassium Nitrate by distilling with Sulphuric Acid. $KNO_3+H_2SO_4=KHSO_4+HNO_3$.

CHARACTERS.—A colorless, fuming [liquid, very caustic and corrosive, and having a peculiar, somewhat suffocating odor. Sp. gr., about 1.414.]

IMPURITIES.—Sulphuric acid, nitre, and lower nitrogen oxides, giving ruddy fumes.

INCOMPATIBLES.—Alcohol, alkalies, carbonates, oxides, iron sulphate, and lead acetate.

Nitric Acid is contained in Liquor Ferri Nitratis, Liquor Zinci Chloridi, and Unguentum Hydrargyri Nitratis.

Acid, 820.]

3. **Acidum Nitrohydrochlori**

drochloric Acid. *Synonym.*—Dilute
40; Hydrochloric Acid, 180; dis
Chlorine, Hydrochloric, Nitric and N
dissolved in water.]

Dose, 5 to 30 m.; [.30 to 2.0

3. ACIDUM HYDROCHLORICU

onym.—Muriatic Acid. A liquid compoun
Absolute Hydrochloric Acid (HCl=36.37)

SOURCE.—The fumes produced by th
Sodium Chloride are dissolved in water. 2
$NaHSO_4$ and $NaCl+NaHSO_4=HCl+Na_2S$

CHARACTERS.—A colorless, fuming li
intensely acid taste. Sp. gr., about 1.163.]

INCOMPATIBLES.—Lead and silver salts,

Hydrochloric Acid is contained in Liquo
Chloridi.

Preparation

1. **Acidum Hydrochloricum D**

Acid. *Synonym.*—Diluted Muriatic
distilled water, 219. Sp. gr., about 1

Diluted Hydrochloric Acid is con

Dose, 5 to 20 m.; [.30 to 1.20

2. **Acidum Nitrohydrochloricu**

3. **Acidum Nitrohydrochloricu**

4. ACIDUM PHOSPHORICUM

CHARACTERS.—A colorless liquid, without odor, but having a strongly acid taste. Sp. gr., 1.347.]

IMPURITIES.—Calcium preparations, and sodium carbonate.

Phosphoric Acid is contained in Syrupus Quininæ et Strychninæ Phosphatum.

Preparation.

Acidum Phosphoricum Dilutum.—[Diluted Phosphoric Acid. Phosphoric Acid, 100; distilled water, 750. Sp. gr., about 1.057. It contains 10 per cent., by weight, of absolute Orthophosphoric Acid.

CHARACTERS.—It resembles the Phosphoric Acid.]

Dose, 5 to 30 m.; [.30 to 2.00 c.c.]

5. ACIDUM ACETICUM.—Acetic Acid. [A liquid composed of 36 per cent., by weight, of absolute Acetic Acid ($HC_2H_3O_2 = 59.86$) and 64 per cent. of water.

SOURCE.—By distilling Sodium Acetate with Sulphuric Acid, $NaC_2H_3O_2 + H_2SO_4 = HC_2H_3O_2 + NaHSO_4$. The Acetic Acid distils out, and is obtained by crystallization.

CHARACTERS.—A clear, colorless liquid, having a strong, vinegar-like odor, a purely acid taste, and a strongly acid reaction. Sp. gr., about 1.048.]

IMPURITIES.—Lead and copper, sulphuric, hydrochloric and sulphurous acids.

Acetic Acid is used to make the Aceta, *and in* several preparations.

Preparation.

Acidum Aceticum Dilutum.—[Diluted Acetic Acid. Acetic Acid, 100; distilled water, 500. Sp. gr., about 1.008. It contains 6 per cent., by weight, of absolute Acetic Acid.]

Dose, 1 to 8 fl. dr.; [4. to 30. c.c.]

6. ACIDUM ACETICUM GLACIALE.—[Glacial Acetic Acid. $HC_2H_3O_2 = 59.86$.

SOURCE.—Distil dry Sodium Acetate with strong Sulphuric Acid. $NaC_2H_3O_2 + H_2SO_4 = HC_2H_3O_2 + NaHSO_4$.

CHARACTERS.—A clear, colorless liquid, of a strong, vinegar-like odor, and a very pungent, purely acid taste. Sp. gr., not higher than 1.058, corresponding to at least 99 per cent. absolute Acetic acid.]

7. ACIDUM CITRICUM.—Citric Acid. $H_3C_6H_5O_7 + H_2O$ [$= 209.50$.]

SOURCE.—Found in the fruits of the Lime (*Citrus Bergamia*) and Lemon (*Citrus Lemonum*). Chalk is added to the boiling juice, usually lemon juice. $2H_3C_6H_5O_7 + 3CaCO_3 = Ca_3(C_6H_5O_7)_2 + 3CO_2 + 3H_2O$. The precipitated Calcium Citrate is boiled with Sulphuric Acid. After filtration and evaporation, Citric Acid crystallizes out. $Ca_3(C_6H_5O_7)_2 + 3H_2SO_4 = 2H_3C_6H_5O_7 + 3CaSO_4$.

matters.

Free Citric Acid is contained in Limonis Suc

[*Citric Acid is used to make* Bismuthi Citra Ferri et Quininæ Citras Solubilis, Ferri et Stry Citratis, Liquor Magnesii Citratis, Liquor Potassii vescens, and Magnesii Citras Effervescens.]

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

[*Preparation.*

Syrupus Acidi Citrici.—Syrup of Cit water, 10; Spirit of Lemon, 10; Syrup to 10

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

8. ACIDUM TARTARICUM.—Tartaric A

SOURCE.—Boil Acid Potassium Tartrate with $HC_4H_4O_6 + CaCO_3 = CaC_4H_4O_6 + K_2C_4H_4O_6 +$ Chloride is now added. This precipitates more Cal $+ CaCl_2 = CaC_4H_4O_6 + 2KCl$. The Calcium Tar with Sulphuric Acid. $CaC_4H_4O_6 + H_2SO_4 = H_2$ evaporate the fluid to the Sp. Gr. of 1.21. Separ crystals that form. Again evaporate, Tartaric Acid

CHARACTERS.—Colorless, [translucent monoc those of Citric Acid, or crystalline crusts, or a whit acid taste. *Solubility.*—In 0.8 part of water; in 2.

INCOMPATIBLES.—Potassium salts, calcium, me astringents.

IMPURITIES.—Lead, oxalic acid, lime, and pot

Dose, 8 to 30 gr.; [.50 to

IMPURITIES.—Mineral acids, sugar, lead, and iron.
[*Lactic Acid is used in* Syrupus Calcii Lactophosphatis.]

ACTION OF SULPHURIC, NITRIC, HYDROCHLORIC, PHOSPHORIC, ACETIC, CITRIC, TARTARIC AND LACTIC ACIDS.

External.—All these acids are powerful **irritants** when applied externally. The feeblest is citric. Its concentrated solution has no action on the sound skin, but is irritant to mucous membranes and abraded surfaces. Tartaric is stronger than citric acid; it will act upon the unabraded skin, and applied to a sore it produces pain, a sensation of burning, and considerable vascular dilatation. The remaining acids are very powerful irritants, therefore even weak diluted solutions of them may produce considerable redness and perhaps vesication, and when the solution is strong they are very energetic **caustics**; sulphuric and phosphoric acids, having a powerful affinity for water, are especially active. Sulphuric acid leaves the carbon untouched, therefore it blackens; nitric stains the skin a deep yellow, it does not redissolve the albumin it precipitates, and it is consequently limited in its area of action; nitrohydrochloric is very powerful; hydrochloric is the least active of the mineral acids; glacial acetic acid is useful when a limited action is required. All the stronger acids unite with and **coagulate albumin**; hence weak solutions, not strong enough to form a slough, which by its separation may cause bleeding, will, by coagulating the blood and so plugging the vessels, and by coagulating the albumin in the tissues and so constricting the vessels, act as **astringents** and **hæmostatics.** Diluted solutions of acids are cooling to the flushed skin of fever, therefore they are called **refrigerants.**

Internal.—*Mouth.*—All acids have a peculiar taste, and give rise to a feeling of roughness about the teeth. As the saliva is alkaline they **increase the amount secreted,** consequently by keeping the mouth moist they allay thirst.

Stomach.—It is believed that, if given during a meal, acids will **check** the **flow of gastric juice,** as that is an acid secretion. When the amount of acid secreted by the gastric mucous

[illegible]

not proved that they do any good. Any well-diluted acid, especially sulphuric, may be applied to check slight bleeding, as that of leech-bites, piles, etc. Vinegar can always be obtained; even this should be diluted. In fever the skin is often bathed with vinegar as a refrigerant, and very dilute sulphuric acid is used as a local astringent in the sweating of phthisis.

Internal.—*Mouth.*—As acids damage the teeth they should be taken through a glass tube. Lemon juice or citric acid itself is often used to stimulate the secretion of saliva, and hence allay the thirst of fever patients. Lemonade is a favorite drink for this purpose. Lactic acid has been strongly recommended to dissolve the membrane in diphtheria, but there is no evidence that this treatment benefits the patient. Equal parts of lactic acid and water may be applied with a mop, or a spray of a strength of [1 to 8] of water may be employed. Very dilute nitric acid has been used for the same purpose.

Stomach and Intestines.—Hydrochloric, and to a less extent nitrohydrochloric acid is of the greatest value in that variety of dyspepsia in which the acidity of the gastric juice is deficient. They should, as already explained, be given some little while after a meal. A very useful stomachic mixture consists of diluted nitrohydrochloric acid combined with tincture of nux vomica, and some other stomachic, as compound tincture of gentian. Lactic acid has been used for the same purpose. Acids will often alleviate that form of indigestion in which the patient complains of acid eructations and heartburn. For this purpose they should be given during a meal or before it. They then check the excessive secretion of acid and restrain fermentation. An acid mixture sometimes benefits the indigestion of pregnancy. Vinegar is often drunk to reduce obesity, but it only does so because a long course of any acid will set up a mild gastritis, and thus hinder the digestion and absorption of food. Carbonic acid, taken in an effervescing mixture, is a common and very efficacious gastric sedative, beneficial, therefore, in painful dyspepsia and in vomiting. Diluted sulphuric acid may be used as a hæmostatic in bleeding from the stomach or intestines, but its

[illegible] feeble. It is, however, successful as an astringent in many cases of summer diarrhœa. Nitric and nitrohydrochloric acids, increasing the amount of bile poured into the intestines, are given, and sometimes with much benefit, when it is considered that dyspepsia is due to disordered function of the liver.

Remote effects.—The remote effects of citric, tartaric, and acetic acids have already been [illegible] (*see* p. 65). They are due to the increase in [illegible] the blood and the urine. Phosphoric acid is often [illegible] sickly, anæmic children with the view of improving [illegible] of the red blood-corpuscles, and possibly aiding the growth [illegible] bones, but it has not been proved to have any great value. [illegible] same may be said of the vegetable acids when employed [illegible] scurvy, and of lactic and phosphoric acids when given for [illegible] ses; indeed, the latter is said to do harm. Lime juice was formerly a popular remedy for acute rheumatism, but it did little if any good. Sulphuric acid is by some said to be anhidrotic in the night-sweating of phthisis, and had some reputation as a remote hæmostatic, but it is rarely given now for these purposes. Röhrig found that acids diminished the tracheal secretion, and some physicians find that they diminish the secretions in bronchitis. We thus see that the remote effects of all acids, except citric, tartaric and acetic, are unimportant.

Toxicology.

All these acids are severe gastro-intestinal irritants when given in toxic doses. Tartaric, citric, and lactic are very rarely taken as poisons. The symptoms produced by the whole class are severe burning pain extending from the mouth to the stomach, excoriation of the mouth with the formation of [illegible], great difficulty in swallowing, vomiting of dark-brown, coffee-colored material and shreds of mucus, intense abdominal pain aggravated by the slightest movement, generally obstinate constipation, but if the bowels are open the discharges are dark, from the blood contained in them. Some of the acid generally passes down to the larynx and causes swelling of that organ, and consequently, dyspnœa from obstruction to respiration. The patient becomes cold, clammy, and covered with a cold sweat; his pulse is very feeble, and he suffers from great thirst. *Post-mortem.*—The mucous membrane of the mouth and œsophagus is softened and corroded, and whitish-gray sloughs and hæmorrhages may be seen here and there. The coats of the stomach are softened,

It is often contracted, and it may be perforated, the aperture being irregular. If the acid escapes into the peritoneal cavity, it may act on almost any of the abdominal organs. Should the patient have lived long enough, there may be corrosion and inflammation of parts of the small intestine. The mucous membrane of the throat and larynx is inflamed and swollen.

Treatment.—Alkalies should be given at once, *e. g.*, soap and water, lime water, magnesia, washing soda; and then demulcents, as milk, white of egg, oil, linseed tea. Do not use the stomach tube if Sulphuric Acid has been taken, otherwise wash out the stomach. Morphine may be injected subcutaneously for the pain, and brandy given subcutaneously for the collapse.

CLASS II.

1. **ACIDUM SULPHUROSUM.**—Sulphurous Acid. [A liquid composed of not less than 6.4 per cent. by weight of Sulphurous Acid Gas (Sulphur Dioxide, SO_2=63.91), and not more than 93.6 per cent of water.

SOURCE.—Sulphuric Acid, 80; is heated with Charcoal, 20; and the resulting Sulphur Dioxide is dissolved in water. $4H_2SO_4+C_2=4SO_2+2CO_2+4H_2O$.

CHARACTERS.—A colorless liquid of the characteristic odor of burning Sulphur, and of a very acid, sulphurous taste. Sp. gr., not less than 1.035.]

IMPURITIES.—Sulphuric acid, and mineral matters.

Dose, ½ to 2 fl. dr.; [2. to 8. c.c.]

ACTION.

External.—Sulphurous acid is strongly deoxidizing, and as it takes up oxygen so easily from organic bodies, it readily decomposes them, becoming itself converted into sulphuric acid, and hence is irritant, but not violently so, for the amount of sulphuric acid in proportion to the water is slight. It is a **disinfectant and deodorant**; for, in virtue of its property of absorbing oxygen, it destroys micro-organisms and arrests fermentation. When applied to the skin it is a **parasiticide.**

Internal.—It is believed to act as a disinfectant in the stomach and intestine, but it is very doubtful whether enough of it to have any appreciable action in this direction can be safely taken.

THERAPEUTICS.

External.—Sulphurous acid is chiefly used as an antiseptic, disinfectant, and deodorant. Sulphur [dioxide] is employed as a disinfectant for a sick room after a patient with an infectious

already been described
... the increase in the alkalinity of th
Phosphoric acid is often given to weak, s
with the view of improving the quality of
cles, and possibly aiding the growth of bo
proved to have any great value. The sa
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diminish the secretions in bronchitis.
remote effects of all acids, except citric,
unimportant.

TOXICOLOGY.

All these acids are severe gastro-intestin
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... ns are used for ozæna,
... ompson's fluid (borax,
... rtion of 1 to 8 of warm
... ut the bladder in cystitis.
..., borax, 1; water, 2; gly-
... ax, [of the B. P., which is,
... oney, 16;] are excellent appli-
... the mouth, especially in children.
... for the mouth: Glycerin of borax,
..., 1; water to 48. Borax has been
... nefit, in epilepsy. In rare cases its use
... oric acid is not employed internally in
... or correcting the fœtor of fermentative
... moniacal cystitis, where it is also used in
... of the bladder.]

Carbon is official in three forms:

1. CARBO ANIMALIS.—Animal Ch

SOURCE.—Expose bones, deprived of fa
without access of air, and then powder them.

CHARACTERS.—[Dull, black, granular fra
nearly tasteless.] *Solubility.*—Insoluble in w

[*Preparation.*]

Carbo Animalis Purificatus.—P

SOURCE.—Digest Animal Charcoal
300, and a sufficient quantity of wate
residue to redness in a closed crucible.

CHARACTERS.—[A dull black po
insoluble in water or Alcohol.] Should

Dose, 20 to 60 gr.; [1.20 to 4.0
more as an antidote.

2. CARBO LIGNI.—[Charcoal.] *Syn*

SOURCE.—Wood charred without access o

CHARACTERS.—[A black, odorless, and tas
matter.]

Dose, 20 to 60 gr.; [1.20 to 4.00 gm.]

ACTION.

External.—Dry charcoal absorbs
within its pores. It thus

absorb gases when dry, and it is quickly wetted when taken internally. It is passed in the fæces unchanged.

THERAPEUTICS.

External.—Charcoal has been recommended as an antiseptic and deodorant for foul ulcers, etc., but it is of very little use, for the discharge soon moistens it. For the same reason the poultice [of the B. P: charcoal, 1; flaxseed meal, 3; bread crumb, 4; boiling water, 20], although some of the charcoal is put on dry, is a bad preparation. Charcoal is used in pharmacy as a decolorizing agent.

Internal.—It has been given as a powder, as lozenges, and as biscuits, with the object of preventing fermentation in the stomach, but it cannot be any use after it is wetted. Garrod has shown that a table-spoonful or larger doses of charcoal frequently repeated, are antidotes against most active vegetable poisons, as opium, nux vomica, and aconite, for charcoal seems to have a special attraction for alkaloids. Animal charcoal is the best form to give as an antidote. Charcoal is used as a tooth powder.

CLASS II.—Alcohol, Chloroform, Ether, and Acetic Ether.

These substances produce local anæsthesia by evaporation. They are rubefacient if their vapor is confined. The stomach, heart and central nervous system are first stimulated and then depressed by them.

I. ALCOHOL.

[Ethyl Alcohol. C_2H_5OH=45.9.

Alcohol is official in the eight following forms:]

1. **ALCOHOL.**—[A liquid composed of about 91 per cent., by weight, or 94 per cent., by volume, of Ethyl Alcohol, and about 9 per cent., by weight of water.]

SOURCE.—Macerate rectified spirit with Anhydrous Potassium Carbonate to remove the water, then again with freshly fused Calcium Chloride, and distil.

CHARACTERS.—[A transparent, colorless, mobile and volatile liquid of a characteristic, rather agreeable odor, and a burning taste. Sp. gr. about 0.820. Boils at 172.4° F.; 78° C.] Entirely volatilized.

IMPURITIES.—Resins or oils, detected by turbidity on dilution.

Alcohol is used to make Chloroform.

is prevented in any way, such as by
gutta-percha, or the alcohol is rubbe
fr m the skin, and thus hardens it.
the epidermis, it dilates the vessels,
and produces a **rubefacient** effect.
lating albumin, but the coagulum qu

Internal.—*Mouth.*—When conc
feeling of warmth, or often even a b
mouth. If held there for some time
ficial tissues is coagulated, and the
whitish, congested, and opaque; but
pears, as the coagulum is re-dissolved
Directly [after] the alcohol is put in the
flow of saliva, and the pulse may be q
reflex, for they occur before there is
absorbed. Alcohol has a slight local

Stomach.—Here, also, if the alco
trated, there is a sensation of warmt
only small quantities are given, the
mucous membrane becomes red, and t
tion of gastric juice. All this [has be
of gastric fistula. The result of these
is sharpened, and this explains the cus
people, of taking a little alcohol imm
also the common experience that alcol

gastric pain. It is to a slight extent decomposed into aldehyde and acetic acid, and consequently some of the pepsin, peptones, and proteids are precipitated. This hinders digestion, but usually not sufficiently to outdo the aid due to the vascular dilatation, the increased secretion, and the greater movement. The effect of **large doses** is **very harmful.** The activity of the gastric juice is destroyed, the gastric walls are inflamed, large quantities of mucus are poured out, and if the over-indulgence is continued chronic gastritis ensues, the gastric glands atrophy, and consequently we get the permanent dyspepsia of drunkards.

A single dose of alcohol introduced into the stomach in a concentrated form, *e. g.*, [clear] brandy, immediately produces **important reflex effects.** The heart beats more rapidly and more forcibly, the vessels of the whole body dilate, especially those of the skin; hence there is a feeling of warmth. The blood pressure rises. These reflex effects are well seen in the immediate restoration of a fainting person by the ingestion of a single dose of brandy. Diluted alcohol, *e. g.*, beer, does not produce them. They are quickly followed by the effects of alcohol upon the circulation due to its presence in the blood after absorption.

Intestines.—Here alcohol has a slight **astringent** effect, and consequently it may check diarrhœa.

Blood —Alcohol is absorbed more largely by the blood-vessels than the lacteals. It first increases and then diminishes the amœboid movements of the white blood-corpuscles. It so acts on the red corpuscles as to prevent oxyhæmoglobin from readily yielding up its oxygen, consequently it **diminishes the oxidation of the tissues.** This, in habitual drinkers of large quantities of alcohol, may lead to an imperfect combustion of fat, consequently it accumulates in the tissues, and **obesity,** which is often increased by the amount of saccharine matters alcoholic liquids contain, results. The skin acquires a velvety feeling.

Alcohol is slightly **antipyretic,** lowering the temperature in fever. This is possibly due, in part, to general diminished oxidation.

There has been much difference of opinion whether alcohol while circulating through the body, is oxidized. It has now been shown that, to a considerable extent, it is; therefore it **is a food.** That alcohol is a food is also proved by the fact that the weight of the body will be maintained if a large amount of alcohol is taken, even if the rest of the food is very small in amount.

If only moderate doses are drunk, very little alcohol leaves the body in the urine; with large doses the case is different.

Circulation.—The effects upon the circulation reflexly produced by stimulation of the mouth and stomach have already been mentioned. After alcohol is absorbed it influences the heart markedly. It **beats more powerfully and more rapidly,** the pulse becomes fuller; these results are due to a stimulating effect on the accelerator nerves. The vaso-motor system is acted upon, all the **vessels of the body dilate, especially those of the skin**; therefore, if he previously felt cold, the person who has taken the alcohol feels warm. The **blood-pressure rises,** the increased action of the heart more than compensating for the vascular dilatation. The direct effects of alcohol on the circulation after absorption appear more slowly and last longer; but they are clearly similar to those due to the reflex stimulus from the stomach, and therefore they continue them. The result of the increased circulation through the various organs is that they work to greater advantage, hence the mental faculties are brightened for a time, the muscular strength seems increased, more urine is passed, and the skin perspires. The person who has taken the alcohol, in fact, usually feels generally better for it. This is by no means always so; some persons have a headache or feel very sleepy immediately after alcohol. This is probably because the vessels of the abdomen or skin have dilated so excessively that almost all the blood in the body is in them, and consequently there is very little in the brain. There are many individual peculiarities in the effects of alcohol.

It has been repeatedly proved that these good results are but transitory. The **heart,** although at first stimulated, is **more exhausted after the stimulation** has passed off than it was

before. This is also true of all the organs of the body stimulated by the increased circulation induced by alcohol. In many campaigns and arctic expeditions it has been found that although at first the men, after taking alcohol, could do more work, yet soon they felt so tired and exhausted, that on the whole they could do much more without than with the alcohol. **Large doses** of alcohol do not stimulate the heart at all; they **paralyze** it, both reflexly from the stomach and after absorption. Enormous doses poured into the stomach kill almost immediately by reflex action. A drunkard who is "dead drunk" is, accurately speaking, one who is killed by the paralyzing effect of alcohol on the heart; but the phrase is often applied to any one who is very drunk.

Skin.—Alcohol is a **mild diaphoretic,** partly because of its vaso dilator action, and perhaps also because of some direct influence on the sweat-glands. As just mentioned, the cutaneous vascular dilatation leads to a feeling of warmth if the patient's cutaneous vessels were previously contracted from cold. It may be that part of the **antipyretic** power of alcohol is due to increased radiation from the dilated vessels, and also to evaporation of the increased amount of sweat. If a person is in a cold atmosphere, alcohol, by increasing the radiation from the skin, leads to the loss of so much heat that he may die from cold, although at first the increased cutaneous circulation, making him feel warmer, gives him a delusive feeling of warmth.

Kidneys.—But little alcohol is passed in the urine, much of it being oxidized in the body, some eliminated by the lungs, and traces by the skin. It acts as a **diuretic**; probably this is a secondary result of its vascular effects.

Nervous system.—Unless the dose be very large the whole nervous system is **stimulated**, perhaps to a slight extent directly, but chiefly as a secondary result of the vascular dilatation and cardiac stimulation. The highest functions are most affected. The person who has taken the alcohol talks more fluently and brilliantly, his wits are sharpened, he has a feeling of strength. If the dose has been large, the stage of exaltation of these or any other functions quickly passes into one of depression, the highest

increases the activity of the gastric movements it may relieve flatulence. A single dose of strong spirits poured into the stomach is often employed with great benefit for its reflex stimulant effects on the circulation for those who have fainted, or who are collapsed from cold or any other cause.

Intestines.—Brandy and water will often check diarrhœa. Perhaps this is owing to the astringent power of the brandy.

Fever.—Alcohol has been largely used in all sorts of febrile conditions. We have seen that it impairs oxidation by its action on the red corpuscles, that it is oxidized and is therefore a food, and that it is mildly antipyretic and diaphoretic. These results would be beneficial in fever. On the other hand, the acceleration of the pulse would be distinctly harmful, although it must be remembered that very often, for some unexplained reason, alcohol lowers the pulse in fever; the indigestion caused by the taking of large quantities, and the liability to depression of the respiratory and cardiac centers, would be very undesirable. The best rules are that while alcohol may be given, often with immense advantage in fever, either to aid digestion, to slow the pulse, as a cardiac stimulant if the patient be much collapsed, or to produce sleep, yet it may, in any of the ways alluded to, do harm. Therefore, when it is being used, the effect must be carefully watched, and if the pulse becomes quick and feeble, or, as indicating gastric irritation, the tongue becomes dry and brown, or the skin becomes hot and dry, or the breathing hurried, or the patient suffers from insomnia, the alcohol should be stopped. On the other hand, if the pulse becomes stronger and slower, the tongue and skin moist, the breathing tranquil, and the patient sleeps well, the drug is doing good, and may be continued. We have so many more powerful diaphoretics and antipyretics that alcohol is not often given for these purposes. Of all fevers it is most used for acute lobar pneumonia, and, speaking generally, it is most likely to be valuable when one object is to keep up the patient's strength for a few days only, till the termination of a specific fever of short duration; but it is often given when it is quite unnecessary.

Nervous system—Alcohol may, as just mentioned, be used as a soporific in fever. Many persons who suffer from insomnia find that they can sleep better for a glass of whiskey and water just before going to bed, no doubt because of its depressant action upon the highest centres.

Kidneys and skin.—Alcohol is occasionally given as a diuretic. Gin is the best form, because it usually contains some juniper, which is also diuretic. Although but little alcohol is excreted by the kidneys, it seems to be particularly irritant to the urethra in cases of gonorrhœa and gleet, and some authorities consider that chronic Bright's disease may be induced by alcohol. Almost the only use made of its diaphoretic effect is as a help to cure a cold in the head, for which purpose a strong glass of spirits and water may be taken immediately before going to bed.

TOXICOLOGY.

Large doses of Alcohol will produce death, either instantly by reflex stoppage of the heart, or later by cardiac and respiratory depression after absorption.

Chronic poisoning causes so many diseases that it is really the part of a text-book upon medicine to enumerate them. Very often confirmed drunkards, particularly if they take much spirits, are very thin; this is probably due to the fact that strong spirits cause such marked indigestion that sufficient nourishing food is not absorbed. Other drunkards are fat, especially if they drink beer. Chronic gastritis, cirrhosis of the liver, gout, peripheral neuritis, delirium tremens, mania, and perhaps chronic Bright's disease, may all be directly due to excessive indulgence in alcohol. It renders patients particularly liable to phthisis, and makes them bad subjects for withstanding any severe illness, especially pneumonia, or to undergo severe surgical operations.

II. CHLOROFORMUM.

CHLOROFORM.—[$CHCl_3 = 119.08$. A liquid consisting of 99 to 99.4 per cent., by weight, absolute Chloroform, and 1 to 0.6 per cent. of Alcohol. *Synonym.*—Chloroformum Purificatum.]

SOURCE.—Heat water and Alcohol in a still to 100° F. [37.7° C.], then add Chlorinated Lime; [Chloroform distils over. It is believed that reaction takes place as follows: On bringing together Alcohol and Chlorinated Lime, the Chlorine converts the former into Chloral, which is at once decomposed by the Calcium Hydroxide, yielding Chloroform and Calcium Formate ($Ca(CHO_2)_2$). The Calcium Formate is decomposed by another portion of

Chlorinated Lime into Calcium Carbonate and Chloride, and water. $2C_2H_5OH + 10CaOCl_2 = 2CHCl_3 + 7CaCl_2 + 2CaCO_3 + Ca(OH)_2 + 4H_2O$. In late years a Chloroform quite free from Chlorinated bye products has been obtained from the distillation of Acetone (from destructive distillation of Calcium Acetate) and Chlorinated Lime, from which Chloroform is produced, together with Calcium Acetate, Hydroxide and Chloride. $2(C_3H_6O) + 6(CaOCl_2) = 2(CHCl_3) + Ca(C_2H_3O_2)_2 + 2Ca(OH)_2 + 3CaCl_2$.

CHARACTERS.—A heavy, clear, colorless, [mobile and very diffusible liquid of a characteristic, ethereal odor, and a burning sweet taste. Sp. gr., not below 1.490. It imparts a green color to flame. *Solubility.*—In 200 parts of water, in which it sinks in heavy drops.]

IMPURITIES.—Hydrocarbons, shown by darkening with sulphuric acid, non-volatile compounds, shown by not completely evaporating, and by unpleasant odor, acids and free chlorine.

[**Purification.**—Chloroform which fails to respond to tests of the Pharmacopœia should be purified by the following process: Chloroform, 400; Sulphuric Acid, 80; Dried Sodium Carbonate, 20 gm.; Deodorized Alcohol, 4 c.c. Add the Sulphuric Acid to the Chloroform, contained in a glass-stoppered bottle, and shake them together occasionally during twenty-four hours, avoiding exposure to bright daylight. Separate the lighter Chloroform layer; add to it the Dried Sodium Carbonate, previously rendered anhydrous by heating it in a porcelain capsule on a sand-bath until it ceases to give off aqueous vapor, and shake them together frequently and thoroughly during half an hour. Then transfer the Chloroform to a dry retort, add to it the Alcohol, and distil, by means of a water-bath, at a temperature not exceeding 153° F.; 67.2° C., into a well-cooled, tared receiver, until the distillate measures 255 c.c.]

Dose, 2 to 20 m.; [.12 to 1.20 c.c.]

Preparations.

1. **Aqua Chloroformi.**—[Chloroform Water. Chloroform and distilled water, by agitation, there being always an excess of Chloroform present.

Dose, 1 to 4 fl. dr.; 4 to 15. c.c.]

2. **Linimentum Chloroformi.**—[Chloroform Liniment. Chloroform, 300; Soap Liniment, 700.]

[3. **Emulsum Chloroformi.**—Emulsion of Chloroform. Chloroform, 40; Expressed Oil of Almond, 60; Tragacanth, 15; water to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

4. **Spiritus Chloroformi.**—[Spirit of Chloroform.] *Synonym.*—Chloric Ether. [Chloroform, 60; Alcohol, 940. *Strength.*—6 per cent.

Dose, ½ to fl. dr.; 2. to 4. c.c.]

Action.

External.—Chloroform in many respects acts like alcohol; but it is more powerful. Thus **if allowed to evaporate** on the skin it produces **cold**; therefore the vessels at the point of application contract, and at the same time **local anæsthesia** is induced. If the vapor be confined, or if chloroform be rubbed into the skin, it acts as an **irritant.** The vessels dilate, the part becomes red, and there is a sense of heat. This rubefacient effect may pass on to vesication.

Internal.—*Mouth.*—If concentrated, it produces irritation and a burning sensation. If diluted, it has a **sweetish taste,** which renders Aqua Chloroformi a valuable vehicle for the administration of nauseous drugs. It reflexly gives rise to an increased secretion of saliva, and is a local anæsthetic.

Stomach.—The action of chloroform is **very like** that of **alcohol.** Large doses cause marked gastro-intestinal irritation. Small doses produce a feeling of warmth, dilatation of the gastric vessels, and increased secretion of gastric juice, and more regular and more powerful gastric movements. It is perhaps slightly astringent to the intestines.

Absorption.—It is absorbed into the blood from the stomach and intestines, and, if given as vapor, from the lungs; but it is very uncertain what changes it subsequently undergoes. Probably most of it is decomposed, but some is certainly eliminated in the breath and some in the urine, and it has been stated that it may be found in the blood of those who have been poisoned by it.

Nervous system.—Chloroform is an excellent instance of the law of dissolution (*see* p. 99), and also of the well-known fact that drugs which, in small doses, stimulate any part, in large doses often depress it. The phenomena resulting from the inhalation of Chloroform are commonly divided into three stages.

First stage.—This is, at first, one of general stimulation, the highest functions being the most stimulated, usually unevenly, so that the patient is somewhat incoherent. The imagination is momentarily excited, and he experiences a general feeling of

warmth and comfort spreading over the entire body. The mind, from the irregular excitation, is confused. Sight and hearing are stimulated, he experiences sensations of light and hears noises. The stimulation of all these higher functions is very transitory, and he quickly begins to lose consciousness; he may be aware that people around him are talking without knowing what they are saying, but soon he hears and sees nothing. Sometimes during the early part of this stage he may laugh or cry. The inability to see and hear is quickly followed by considerable blunting of general sensation. At the same time that these higher functions are being depressed the lower motor functions are excited; he will kick and fight, throwing his arms and legs about, so that much strength may be required to hold him down, and he will shout and talk incoherent nonsense very loudly. Almost coincidently the stimulation of the lower centres sets in; the pulse is increased in frequency, and there is throbbing of the heart and great vessels The first inhalation or two may produce a choking sensation and a stoppage of breathing, which is often voluntary; but soon the respirations are increased in frequency. The blood-pressure at first rises a little, and the face may be flushed. The pupils usually dilate.

Second stage.—This is best called that of depression. Some authors call it the stage of excitement, because the excitation of the motor centres may be continued into it. It is important to remember that there is no sharp boundary line between the various stages, they pass insensibly into one another. In this stage the depression of the highest functions continues, so that the patient becomes completely unconscious, and he appears to be in a deep sleep. He sees, hears and feels, nothing, hence chloroform is called a **general anæsthetic.** The excitement of the motor functions passes into depression, and he ceases to shout and struggle. Some of the reflex centres are depressed, so that when the cornea is touched the eye does not shut. The pupil is contracted. The stimulation of the cardiac and respiratory apparatus gives way to depression, the pulse and respiration become less frequent and less strong. The vaso-motor centre is depressed, blood-pressure

falls. As he cannot feel pain, and the reflex activity is so lowered that the heart will not be reflexly inhibited by the shock of an operation, this is the period at which to operate safely.

Third stage.—In this there is a total abolition of reflex excitability. Even the lowest reflex centres of the cord are depressed, so that the patient may pass his urine and fæces involuntarily; all muscular tone is abolished, and consequently the muscles are quite flaccid. Some of them, as those of the arm, were probably in this condition towards the end of the second stage. The pupil is widely dilated, probably because of the commencing asphyxia. This is the period to which the administration is pushed to facilitate the reduction of dislocations, or to enable the abdominal viscera to be felt through the abdominal wall. If still more chloroform is given the depression of the cardiac, respiratory and vaso-motor centres continues, the pulse becomes feeble and irregular, and the heart finally stops in diastole. At last not only its central nervous apparatus, but its muscular tissue is depressed, so that it will not respond to mechanical stimulation. The respiratory movements become slight and irregular, with very long pausesbetween them, and as a result the patient is more or less asphyxiated. The blood-pressure gradually falls to zero. There has been much dispute as to whether chloroform kills by the heart or the respiration. [In the United States it has been generally believed that death is from depression of the cardiac centres.]

The recovery from chloroform also illustrates the law of dissolution. The lowest functions, such as muscular tone, are the first to reappear; but the patient does not usually regain his mental equilibrium for hours.

With the exception of its local action on the skin and alimentary canal, and its last effect on the cardiac muscle, chloroform acts entirely on the central nervous system. Even the peripheral nerves are not affected, unless it be just before death.

Vomiting is very liable to occur during the administration of chloroform, and its advent is often made known by pallor and wide dilatation of the previously contracted pupil. Immediately before death the pupil may be either dilated or contracted.

THERAPEUTICS.

External.— Chloroform is employed in the form of the liniment to produce rubefacient and irritant effects in cases of chronic rheumatism, myalgia, and chronic inflammations.

Internal.—It may be used as a local anæsthetic for toothache, the tooth being plugged with a piece of cotton soaked in chloroform. It disguises the taste of nauseous medicines, and therefore Aqua Chloroformi is a very common vehicle, and Spiritus Chloroformi is much used as a flavoring agent. In the stomach it acts like alcohol, and is given in the same varieties of dyspepsia as are benefited by that drug. Small doses may be used as a cardiac stimulant.

Inhalation.—It is inhaled to abolish sensations of pain, whether from surgical operations, biliary, renal and intestinal colic, or parturition. In the last case but little need be given. It is also inhaled to relax muscular spasm, as in the reduction of dislocations or herniæ, or for the relaxation of muscles for diagnostic purposes, as, for example, when we wish to feel the abdominal viscera thoroughly, or to see whether a swelling is a phantom tumor; or, lastly, it is inhaled to relax spasm in cases of tetanus, hydrophobia, or other varieties of convulsions. The A. C. E. mixture, which consists of alcohol, 1 vol., chloroform, 2 vols., and pure ether, 3 vols., is very commonly employed for all these purposes.

The following points should be attended to in the administration of chloroform:

[1. The anæsthetizer must be skilled, and give his attention exclusively to the production and maintenance of narcosis.]

2. The respiration and pulse should be carefully watched for any signs of failure.

3. The operation should never be begun till reflex action is profoundly depressed, that is to say, till the stage of muscular relaxation has commenced. Many patients have been lost from neglect of this precaution, for the stimulus of the knife has reflexly stopped the heart. It is a common and dangerous error

to think that, because the operation is trivial, it may be begun early; most of the deaths from chloroform have taken place when the operation has been slight.

4. Great care must be exercised if the heart is fatty or feeble from any cause, or if the patient suffer from disease of the lungs, or if he may be very old.

5. In operations about the mouth care must be taken to see that no blood gets down the trachea.

6. It is desirable to have the stomach empty, therefore no solid food should be given for some hours before the administration. The patient's head must be so directed during vomiting that no vomited matter can get into the larynx.

7. False teeth should be taken out of the mouth.

8. The chloroform must be pure.

9. It should not be too concentrated. About 5 per cent. of chloroform to 95 per cent. of air is a good mixture.

10 The head should be a little raised, and the lower jaw held up so that the tongue shall not fall back over the larynx.

11. Special care must be taken when the operation necessitates awkward positions, especially if respiration is interfered with, as in the lateral position used in obstetrical, gynæcological and renal cases.

[12. Chloroform should never be administered without an electric battery and an hypodermatic syringe, in good order, being at hand. Amyl nitrite, ether, brandy and ammonia should be in readiness.] If the breathing becomes very weak, or stops altogether, artificial respiration should at once be commenced, the tongue being pulled forward by forceps to allow free entry of air to the lungs. The face and abdomen should be flicked with wet towels, a capsule of amyl nitrite may be inhaled, and ether or brandy injected subcutaneously. It is doubtful whether galvanization over the cardiac area is any use; perhaps it does harm. [If symptoms of improvement do not appear at once, the patient should be inverted.] Artificial respiration should be maintained at least an hour or so, even if there is no sign of returning life; and if there is the slightest evidence of a cardiac beat, or a single

automatic respiratory movement, artificial respiration must be persevered in even for many hours. If the face be pale, the head should be lowered, and amyl nitrite is especially likely to be useful. [In spite of all care in administration and the observance of all precautions, one death takes place in about three thousand administrations. Hare and Thornton, after a painstaking series of experiments, believe chloroform to be safe for the majority of cases, provided it be given by one skilled in its use, and who not only knows how to give it, but to detect signs of danger. The respiration should be watched, because so soon as enough chloroform is used to endanger the circulation, the respiration will show some abnormality. Death in the healthy animal is always due to respiratory failure, accompanied by circulatory depression which may be severe enough to cause death, even if artificial respiration be skillfully used. Chloroform may be chosen in hot climates; when a large number of persons are to be anæsthetized; in Bright's disease; in aneurism; or in great atheroma of blood-vessels; in children or adults who have already bronchitis; and in persons who struggle violently.]

III. ÆTHER.

ETHER.—[$(C_2H_5)_2O$=73.84. *Synonyms.*—Sulphuric Ether. Ethyl Oxide. A liquid composed of about 96 per cent., by weight, of absolute Ether, and about 4 per cent. of Alcohol containing a little water.]

SOURCE.—Alcohol is distilled with Sulphuric Acid. Ethyl Sulphuric (Sulphovinic) Acid and water are first formed. $C_2H_5OH+H_2SO_4=C_2H_5HSO_4$ $+C_2H_5OH=(C_2H_5)_2O+H_2SO_4$. This process is theoretically continuous, the Sulphuric Acid last formed again acting on fresh Alcohol as it is supplied. The Ether is freed from water by redistillation with Calcium Chloride and lime.

CHARACTERS.—[A transparent, colorless, mobile liquid, having a characteristic odor, and a burning and sweetish taste. It is very inflammable, boils about 98.6 F., [37° C.] and burns with a white flame. Sp. gr. 0.725 to 0.728. *Solubility.*—In about 10 volumes of water.]

IMPURITIES.—Water, alcohol and fixed impurities.

Dose, 5 to 60 m.; [.30 to 4.00 c.c.]

Preparations.

1 **Spiritus Ætheris.**—[Spirit of Ether. Ether, 325; Alcohol, 675. **Dose ¼ to 1 fl. dr.; 1. to 4. c.c.]**

[2. **Oleum Æthereum.**—Ethereal Oil. A volatile liquid composed of equal volumes of heavy Oil of Wine and Ether. Alcohol, 1000; Sulphuric Acid, 1000; distilled water, 25; Ether, a sufficient quantity; by distillation.

CHARACTERS.—A transparent, nearly colorless, volatile liquid, of a peculiar, aromatic, ethereal odor, a pungent, refreshing, bitterish taste, and a neutral reaction. Sp. gr. 0.910.

Ethereal Oil is used to prepare Spiritus Ætheris Compositus.]

3. **Spiritus Ætheris Compositus.**—[Compound Spirit of Ether.] *Synonym.*—Hoffman's Anodyne. [Ether, 325; Alcohol, 650; Ethereal Oil, 25.

Dose, 5 to 60 m.; .30 to 4.00 c.c.]

ACTION.

External.– Ether evaporates very quickly, producing **great cold**, and consequently the part to which it has been applied becomes white from the contraction of the vessels. The cold is sufficient to cause such marked **local anæsthesia** that the pain of slight operations, performed upon the part anæsthetized, cannot be felt. To produce this result ether is best applied as a fine spray. If it be rubbed in, or evaporation be prevented, it, like alcohol or chloroform, is an **irritant**.

Internal.—In the mouth and stomach also it acts like **chloroform** or **alcohol.** Thus ether causes a burning taste in the mouth, an increase of the saliva, of the gastric secretion and gastric movements, and dilatation of the vessels of the stomach. Consequently it is carminative and aids digestion. Directly it reaches the stomach it **reflexly** excites the heart, increasing the force and frequency of the pulse, and causing a rise of blood-pressure; it is one of the best **cardiac stimulants** we have. In the same way it excites respiration. It is quickly absorbed, and its stimulating influence on the heart and respiration is continued. It is thus a good instance of a rapidly diffusible stimulant. It is also antispasmodic.

Nervous system.—Ether is a powerful **general anæsthetic.** The phenomena and stages of ether anæsthesia are so like those of chloroform anæsthesia that the description already given (*see*

p. 261) will suffice. The following differences, however, should be noticed:

(1) The heart is paralyzed with much greater difficulty by ether than by chloroform.

(2) The same is true of the vaso-motor centre.

(3) And also of the respiratory centre.

(4) Ether is much more irritant to the respiratory mucous membrane, and hence is more liable to increase bronchitis in those already suffering from it.

(5) [Ether is much more likely to irritate the kidneys, and those suffering from the various forms of acute or chronic renal disease, or even from renal insufficiency, should be subjected to its anæsthesia only when it is administered with the greatest caution.]

(6) With ether the stage of stimulation is more protracted, therefore there is more struggling, and the anæsthetic stage is not reached so soon.

(7) Ether must be given nearly pure, about 30 per cent. of air to 70 of ethereal vapor; hence it is more difficult to administer.

(8) The smell of ether is more disagreeable, and lingers about the patient longer.

(9) Ether being very inflammable cannot be used in the close neighborhood of an artificial light.

[Ether is more generally used as an anæsthetic in the United States.]

THERAPEUTICS.

External.—Ether, allowed to evaporate, may be used to cause local anæsthesia in cases of neuralgia. An ether spray is occasionally employed to produce local anæsthesia for small operations, but as the ether makes the skin hard and brawny the operation must be quite superficial, and even then there is much subsequent tingling and pain.

Internal.—*Stomach.*—It may be used for the same classes of dyspepsia as chloroform or alcohol, and is often employed as a carminative to expel gas in flatulent dyspepsia.

Heart.—Administered subcutaneously (dose 10 to 15 minims

[.60 to 1.00 c.c.] or by the mouth, ether is an excellent cardiac stimulant of great value in fainting, cardiac failure, or palpitation, its advantage over chloroform and alcohol being that it is more rapid in its action. It is very useful as an antispasmodic during an attack of asthma.

Inhalation.—Ether is inhaled for the same purpose as chloroform. There is great divergence of opinion which is the safer anæsthetic. All the published statistics in which the two are contrasted appear to show that ether is much safer, and this is what might have been expected from the contrast between the two already given; but it is alleged that chloroform is often administered carelessly, and that with proper care it is [as safe as] ether.

IV. ÆTHER ACETICUS.

ACETIC ETHER.—$C_2H_5C_2H_3O_2$[=87.8. *Synonym.*—Ethyl Acetate. A liquid composed of about 98.5 per cent., by weight, of Ethyl Acetate, and about 1.5 per cent. of Alcohol, containing a little water.

SOURCE.—A mixture of Sodium Acetate, Sulphuric Acid and Alcohol is distilled. $C_2H_5OH + NaC_2H_3O_2 + H_2SO_4 = C_2H_5C_2H_3O_2 + NaHSO_4 + H_2O$.] The distillate is purified from acid and water by digestion with Potassium Carbonate.

CHARACTERS.—[A transparent, colorless liquid, of a fragrant and refreshing slightly acetous odor, and a peculiar, acetous, and burning taste. Sp. gr. 0.893 to 0.895. *Solubility.*—In 8 parts of water; freely in Alcohol or Ether.]

Dose, 20 to 60 m.; [1.20 to 4.00 c.c.]

ACTION AND THERAPEUTICS.

It acts like ether, as a stimulant, antispasmodic, and carminative, but has a pleasanter taste.

CLASS III.—The Nitrites.

Sodii Nitris, Amyl Nitris and Glonoinum.

All of these dilate the peripheral vessels, and increase the rapidity of the heart.

I. SODII NITRIS.

SODIUM NITRITE.—$NaNO_2$ [=68.93.]

SOURCE.—Made by Heating Sodium Nitrate with Lead, which becomes an oxide, taking Oxygen from the nitrate. [$NaNO_3 + Pb = NaNO_2 + PbO$.

CHARACTERS.—White opaque, fused masses, usually in the form of pen-

cils, or colorless, transparent, hexagonal crystals; odorless, and having a mild, saline taste. When exposed to the air, the salt deliquesces and is gradually oxidized to Sodium Nitrate. *Solubility.*—In about 1.5 parts of water; slightly soluble in Alcohol.]

Dose, 2 to 5 gr.; [.12 to .30 gm.]

Preparation.

Spiritus Ætheris Nitrosi.—[Spirit of Nitrous Ether. *Synonym.*—Sweet Spirits of Nitre.

An Alcoholic solution of Ethyl Nitrite ($C_2H_5NO_2 = 74.87$), yielding, when freshly prepared, not less than 11 times its own volume of Nitrogen Dioxide.] In many commercial specimens there is very little Ethyl Nitrite.

SOURCE.—[Dissolve Sodium Nitrite, 750, in water; adding Deodorized Alcohol, 550; introduce into the containing flask Sulphuric Acid, 520; previously diluted, and distil. Wash the distillate with ice-cold water, remove traces of acid by Sodium Carbonate, 10, dissolved in water; agitate with Potassium Carbonate to remove all traces of water, and add sufficient Deodorized Alcohol.]

CHARACTERS.—A clear, mobile, volatile, inflammable liquid of a pale yellowish or faintly greenish-yellow tint [having a fragrant, ethereal and pungent odor, free from acridity, and a sharp, burning taste.] Sp. gr. 0.836 to 0.842.

INCOMPATIBLES—Potassium iodide, ferric sulphate, tincture of guaiacum, gallic and tannic acids, and emulsions.

IMPURITY.—Excess of acetic acid.

Dose, ½ to 2 fl. dr.; [2. to 8. c.c.]

ACTION.

External.—Spirit of nitrous ether evaporates when it is applied externally, and slightly anæsthetic effect is produced.

Internal.—It combines the action of the ether with that of the nitrites contained in it. Because of the ether it is a **diffusible stimulant**, a **stomachic** and a **carminative.** Because of the nitrites it acts like amyl nitrite; but as the ethyl nitrite is so diluted, its action in this direction is feeble; thus it only **moderately dilates the vessels,** and except in poisonous doses probably does not affect the blood. The dilatation of the vessels leads to a **diaphoretic** effect on the skin, a **diuretic** effect on the kidney, and a lowering of arterial blood-pressure.

The dilatation of the cutaneous vessels, the sweating, and perhaps the changes of the blood, produce a slight antipyretic influence. It is obvious that in these effects the nitrites will to some extent be aided by the ether. [Sodium nitrite possesses the same, but a more lasting, action as the spirit of nitrous ether.]

Therapeutics.

For its diaphoretic and slight antipyretic effects it is commonly given in mild febrile attacks, such as a common cold. It is also used as a diuretic in chronic Bright's disease, and cardiac and pulmonary diseases accompanied by œdema [but for these purposes the sodium nitrite is preferable].

II. AMYL NITRIS.

[**AMYL NITRITE.** $C_5H_{11}NO_2 = 116.78$. A liquid containing about 80 per cent. of Amyl (principally Iso-Amyl) Nitrite, together with variable quantities of undetermined compounds.]

Source.—By action of Nitric Acid upon Amylic Alcohol. $HNO_3 + C_5H_{11}OH = C_5H_{11}NO_2 + 2H_2O$. Purify the distillate with Sodium Carbonate.

Characters.—[A clear yellow, or pale-yellow liquid, of a peculiar, ethereal, fruity odor, and a pungent, aromatic taste. Sp. gr. 0.870 to 0.880. *Solubility.*—Insoluble in water;] soluble in Ether, Chloroform, or Alcohol.

Impurities.—Free acid and amyl nitrate.

Dose, [1 to 3 m ; .06 to .20 c.c.] cautiously inhaled from a handkerchief in which a glass capsule containing the Amyl Nitrite has been crushed; ½ to 1 m.; [.03 to .06 c.c.,] **internally,** dissolved in [alcohol.]

Action.

External.—Locally applied it diminishes the activity of the sensory nerves, but they quickly recover.

Internal.—Amyl nitrite is rarely given by the mouth, so the following account will refer to the effects of inhalation.

Circulation.—From the medical point of view by far the most important effects of amyl nitrite are those produced upon the heart and vessels. Within a minute of inhalation the **face flushes,** the **heart** beats very **rapidly** and **violently,** there is a throbbing in the head, and the vessels, *e. g.*, the carotids, may be seen to pulsate actively. Headache, giddiness, dilatation of the pupils,

and increased respiratory movements quickly supervene. All the vessels of the body rapidly dilate, hence the flushing. They may be actually seen to widen in the ear of a rabbit or in the retina. This is due to a direct action on the muscular coats of the arterioles, for it happens if the cord is destroyed. The blood-pressure and arterial tension, of course, fall very low. The increase in the rate of the pulse is unaccompanied by any alteration in the force of the beat; it is apparently due to a depressing influence on the inhibitory vagus centre; [the vaso-motor paralysis will, however, produce a rapid pulse]. In toxic doses the heart may be arrested in diastole from direct action on the cardiac muscle.

Respiration.—The rapidity and depth of respiration are at first increased, probably from central stimulation; the respiratory centres are later depressed, the breathing becoming slower and shallower, and usually death finally occurs from paralytic asphyxia of central origin.

Nervous system.—Many of the symptoms referable to the nervous system are secondary effects of the dilatation of the vessels of the brain and spinal cord. Such are the throbbing, sense of fullness, giddiness and headache noticed directly after inhalation. The headache may remain some time. If much has been inhaled there is unsteadiness of gait and general restlessness. The pupil dilates, and disturbances of vision are present. The motor centres of the cord are profoundly depressed; therefore after large doses reflex actions are abolished. The function of sensory nerves, motor nerves, and muscles is depressed by the local application of the drug to them, but not after inhalation until shortly before death.

Temperature.—Amyl nitrite causes this to fall considerably, both in fever and health. The fall is due to the peripheral vascular dilatation, and if large doses are given, to the changes in the blood.

Urine.—The drug probably escapes in the urine; it is slightly diuretic, and may cause the excretion of a body reducing Fehling's solution.

Blood.—Outside the body nitrites greatly diminish oxidation,

and the same takes place in the blood. After the inhalation of a considerable amount (more than is usually given to a man) the arterial and venous blood both become a uniform chocolate color. This is due to the formation of methæmoglobin. The blood can no longer absorb oxygen, and hence its oxidizing power is abolished.

THERAPEUTICS.

Heart and blood-vessels.—Brunton in 1867 observed that in a case of angina pectoris the peripheral vessels were strongly contracted during an attack of pain. This induced him to make the patient inhale amyl nitrite, and it was found that the vessels dilated and the pain passed off. Inhalation of [amyl] nitrite is now used for all sorts of cardiac pain, especially when it comes on in paroxysms. Generally the drug affords relief in a minute or so after inhalation, but by no means always. We do not sufficiently understand the pathology of angina pectoris to know how it acts. It may be by dilating the peripheral vessels; but against that view is the fact that they are not always contracted during attacks of angina pectoris, and amyl nitrite may relieve patients in whom the vessels are not contracted. The attacks of pain common in thoracic aneurism may be relieved by it. It is used to avert the pallor sometimes seen during the administration of chloroform. The peculiar hot flushes experienced by some women during the menopause are benefited by inhalation of it.

Nervous System.—If it is inhaled when the aura is felt an epileptic fit may sometimes be prevented. Because in migraine the vessels of the head are contracted, it has been used, and sometimes successfully, for this complaint. Its depressing action on the cord has suggested its employment in tetanus and strychnine poisoning.

Occasionally the inhalation of amyl nitrite relieves an attack of asthma. It has been given in whooping-cough, sea-sickness and cholera, but without much good effect.

III. GLONOINUM.

[**SPIRITUS GLONOINI.**—Spirit of Glonoin. *Synonym.*—Spirit

of Nitroglycerin. An alcoholic solution of Glonoin, Glyceryl (or Propenyl) trinitrate, Nitroglycerin, or Trinitrin; $C_3H_5(NO_3)_3 = 226.58$], containing 1 per cent., by weight, of the substance.

SOURCE.—Nitroglycerin is prepared by gradually adding dehydrated Glycerin to Nitric and strong Sulphuric Acid, the result being Propenyl trinitrate or Trinitroglycerin. $C_3H_5(OH)_3 + 3HNO_3 = C_3H_5(NO_3)_3 + 3H_2O$. It separates as an oily layer which is washed with water and with dilute soda solution to remove all acid.

CHARACTERS.—A clear, colorless liquid, possessing the odor and taste of Alcohol. Caution should be exercised in tasting it, since even a small quantity of it is liable to produce a violent headache. The same effect is produced when it is freely applied to the skin. Sp. gr. 0.826 to 0.832.

Dose, 1 to 3 m.; .06 to .20 c.c.]

ACTION AND THERAPEUTICS.

Its action is the same as that of amyl nitrite, except that the effects of Spirit of Glonoin are more persistent, and as it is only suitable for internal administration, they are slower in their onset. It is largely taken by persons liable to cardiac pains with the object of warding off the attack. Some authors regard it as a glycerin nitrate, but certainly physiologically it belongs to the class of nitrites. Those who look upon it as a nitrate, suppose that directly it gets into the body, a nitrite is formed.

CLASS IV.—The Hypnotics.

Chloral and Paraldehyde.

I. CHLORAL.

CHLORAL.—$C_2HCl_3O + H_2O$[$= 164.97$. *Synonym.*—Chloral Hydrate.

SOURCE.—Absolute Alcohol is saturated with dry Chlorine; Aldehyde and Hydrochloric Acid are first formed. $C_2H_5OH + Cl_2 = C_2H_4O + 2HCl$. By the continued action of the Chlorine Gas 3 atoms of Hydrogen are abstracted from the Aldehyde and replaced by 3 atoms of Chlorine, producing Chloral. $C_2H_4O + 3Cl_2 = C_2HCl_3O + 3HCl$. It is purified by Sulphuric Acid, then by Lime.

CHARACTERS.—Separate, rhomboidal, colorless and transparent crystals, having an aromatic, penetrating and slightly acid odor, and a bitterish, caustic taste. Easily melted by gentle heat. *Solubility.*—Freely in water, Alcohol and Ether.] Forms a liquid when rubbed up with an equal weight of camphor.

INCOMPATIBLES.—All alkalies decompose it.

IMPURITIES.—Hydrochloric acid and oily impurities.

Dose, 5 to 20 gr.; [.30 to 1.20 gm.]

ACTION.

External.—It is a powerful **antiseptic.** Locally applied it is irritant, causing vesication.

Internal.—*Alimentary canal.*—Unless diluted, chloral is a gastric irritant; large doses, therefore, may give rise to vomiting and purging.

Blood.—It is readily absorbed, and circulates in the blood unchanged. It was formerly thought that as alkalies convert it into chloroform and formic acid, this change would take place in the blood, and consequently Liebreich suggested its use as an hypnotic. It is now known that this view is wrong, for no chloroform can be found in the blood of chloralized animals, nor in the urine unless that fluid is alkaline, in which case chloral is decomposed by the alkali in the urine.

Circulation.—Chloral **depresses the heart,** large doses having this action to a considerable degree. This is due to a local effect on the organ itself; probably both the muscular substance and the nerves contained in it are affected. The pulse, which may at first be slightly quickened, soon becomes slow, feeble, and irregular, and the heart finally stops in diastole. The **vaso-motor centre is depressed,** and consequently the vessels dilate. As a result of these actions on the heart and the vessels the **blood-pressure falls.**

Respiration.—After large doses the respirations become slow and full, and after toxic doses they become irregular and shallow before finally ceasing. This is due to the action of chloral on the respiratory centre.

Temperature.—Large doses cause this to fall, probably by diminishing the production of heat.

Brain.—Chloral is a **powerful hypnotic,** acting directly on the brain. The stage of excitation, if it exists, is very short. Soon after taking a moderate dose the patient is overcome by sleep, which lasts several hours, and is indistinguishable from natural sleep. On waking there is neither confusion nor headache, and he feels refreshed. Large doses produce coma. The pupil is always contracted.

Spinal cord.—At first the anterior cornua may be slightly stimulated, but soon they are depressed, and there is consequently paralysis and loss of reflex excitability. The motor nerves and the muscles are not affected, nor are the sensory nerves unless the dose is very large, when there may be anæsthesia.

It will be observed that chloral is a **powerful general depressant,** chiefly of the cerebrum, but also of the respiratory centre, the vaso-motor centre, the anterior cornua of the production of heat, and the heart. It is only because it depresses the cerebrum much earlier than any other part of the body that we can use it as an hypnotic.

Therapeutics.

External.—The compound with camphor has been employed as a local anodyne for neuralgia, and may be applied to aching teeth.

Internal.—Chloral is largely used for its hypnotic effect. Its great advantages over many other hypnotics are that doses sufficient to produce a deep sleep are not large enough to cause gastro-intestinal irritation, cardiac and respiratory depression, and the other harmful effects. Chloral is certain in its action; it quickly produces sleep; and there are no bad after-effects. Children take it well.

It is especially useful in simple insomnia from overwork, worry, etc. Its disadvantages are that it does not relieve pain at all, and it should therefore not be used for insomnia due to this cause; and that, as it depresses the heart and respiration, it must be given carefully in diseases of the heart and lungs. In febrile insomnia it is very valuable in the early stages, but must be given cautiously, later, when there is any danger of cardiac weakness. It does not relieve the distress and cough of disease of the heart and lungs. It has been used as a cerebral depressant in delirium tremens, puerperal convulsions, and mania, but very large doses are required, and consequently the results must be watched with great care.

From its action on the spinal cord, chloral has been used, and

sometimes with success, in tetanus, whooping-cough, incontinence of urine and strychnine poisoning.

TOXICOLOGY.

Acute Poisoning.—As will be inferred from the action of Chloral, the symptoms of poisoning by it are deep coma; a weak, feeble, irregular, slow pulse, which may become quick before death; diminished frequency of respiration and consequent lividity; and abolition of reflex movements. The surface of the skin is cold, and the temperature is subnormal.

Treatment.—Give emetics or wash out the stomach. Keep up the temperature by hot bottles, hot blankets, friction and massage. Prevent sleep by the injection of hot, strong coffee into the rectum, shouting at the patient, hitting him, flapping with wet towels, bathing, etc. Give a subcutaneous injection of strychnine, because of its stimulant action on the anterior cornua. Use inhalations of Amyl Nitrite to stimulate the heart, and artificial respiration if necessary.

Chronic Poisoning.—The taking of Chloral is a vice to which many persons are addicted. A craving for it is soon established. The chief symptoms of chronic Chloral poisoning are gastro-intestinal irritation, a great liability to erythematous eruptions, dyspnœa dependent upon the cardiac and respiratory depression, and general weakness. There may be disturbance of the mental equilibrium, and persons have been known to become permanently weak-minded. A slightly larger dose than usual may be quickly fatal.

II. PARALDEHYDUM.

[**PARALDEHYDE.**—$C_6H_{12}O_3$[= 131.7.]

SOURCE.—A product of the polymerization of Ethylic Aldehyde by means of various Acids or Salts. For example, Ethylic Aldehyde may be acted on by Hydrochloric Acid, Carbonyl Chloride ($COCl_2$), Sulphur Dioxide or Zinc Chloride; during the action, the temperature of the mixture rises, and almost complete conversion into Paraldehyde takes place. On cooling to below 32° F. [0° C.], Paraldehyde crystallizes. $3C_2H_4O = C_6H_{12}O_3$.

CHARACTERS.—A colorless [transparent liquid, having a strong, characteristic, but not unpleasant or pungent odor, and a burning and cooling taste. *Solubility.*—In 85 parts of water; freely in Alcohol and Ether.]

Dose, ¼ to 1 fl. dr.; [1. to 4. c.c.]

ACTION.

External.—It is antiseptic.

Internal.—Even large doses do not affect the gastro-intestinal tract, heart or respiration; but enormous doses of paralde-

hyde weaken the action of the heart, and kill by paralysis of the respiratory center.

Nervous system.—It is a **powerful hynoptic,** without any unpleasant after-effects. It acts quickly, and the sleep, which lasts several hours, is quiet, refreshing and dreamless. Paraldehyde in toxic doses paralyzes the anterior cornua of the spinal cord; thus it abolishes reflex action and causes paralysis. It does not affect nerves or muscles.

THERAPEUTICS.

It is given solely as an hypnotic in the same class of cases as chloral, and as it does not act on the heart it may also be used for patients suffering from cardiac disease. It has been used largely in asylums to produce quiet in mania and sleep in melancholia. It may produce an erythematous rash. The great objection to its use is its extremely [disagreeable] taste, which is best covered by prescribing it with syrup and tincture of orange peel in at least two fluid ounces [60 c.c.] of water to insure that a usual dose will be dissolved. [It can also be administered in glycerin in a 25 per cent. solution, which renders it more palatable. It gives an extremely offensive and persistent odor to the breath.]

CLASS V.—**Drugs which have an Antipyretic and Analgesic Action.**

[The single official representative is Acetanilid.]

ACETANILIDUM.

ACETANILID.—$C_6H_5NH.C_2H_3O$[=134.73.] *Synonyms.*—Phenylacetamide. Antifebrin. An Acetyl derivative of Aniline.

SOURCE.—Glacial Acetic Acid and pure Aniline are heated together, the excess of both ingredients is then distilled off, and the congealed residue is crude Acetanilid, which is purified by repeated crystallization from water. $C_6H_5NH_2 + HC_2H_3O_2 = C_6H_5NH.C_2H_3O + H_2O$.

CHARACTERS.—[White, shining micaceous crystalline laminæ, or a crystalline powder, odorless, having a faintly burning taste, and permanent in the air. *Solubility.*—In 194 parts of water, and in 5 parts of Alcohol; also soluble in 18 parts of Ether, and easily soluble in Chloroform.

INCOMPATIBLES.—Potassium and sodium hydrate, and chloroform.

IMPURITIES.—Aniline and its salts.

Dose, 2 to 5 gr.; .12 to .30 gm.]

Action of Acetanilid.

It has no action externally or on the gastro-intestinal tract.

Blood.—With ordinary doses of this drug this fluid is unaffected, but in large doses the color is changed, from the formation of methæmoglobin. The passage of this in the urine discolors it. It causes the red corpuscles to break up, and arrests the movements of the white.

Heart.—This substance **depresses the heart.** It is not known how it does this; but what little evidence there is appears to show that it has a directly paralyzing action on the cardiac muscle.

Vessels.—Acetanilid contracts the smaller vessels from direct action on their muscular coat. The blood-pressure therefore rises. This substance is, owing to this property, a local hæmostatic.

Respiration.—This is not affected by ordinary doses. After toxic doses the force of the respiratory act progressively diminishes.

Kidneys.—This substance is a mild diuretic. The excretion of urea is stated to be increased by it, but some say it is diminished. Large doses cause the urine to be dark from the passage of altered blood. Acetanilid is said to be excreted as aniline, but this requires confirmation.

Skin.—It may produce an erythematous rash, and it is occasionally a mild diaphoretic.

Temperature.—This substance is a powerful **antipyretic.** It has a very slight action on the temperature of health, but it reduces it very markedly when it is raised from any cause. It was introduced into medicine for this property. We have already seen (*see* p. 68) how numerous are the ways in which antipyretics may act. The fall of temperature produced by this drug is not due to any action on the blood or the circulation, and it is too marked to be entirely owing to its slight diaphoretic action. It decreases heat production, and it is most likely that it acts directly upon that part of the central nervous system,

probably upon the corpora striata, which preside over heat production. It, to a much less extent, increases heat dissipation. The result of these two actions is that the temperature falls. The proof of these statements is too long and complicated to give here, but we may mention that it is easy to show both by a calorimeter, and by the decrease of the products of the febrile destruction of tissue, such as urea, that these drugs diminish heat production. The experiments which have been made to show that this is due to an action on the central nervous system are intricate and require confirmation.

Nervous system.—This drug is a powerful **analgesic.** Acetanilid in large doses is said to produce first convulsions, then coma and paralysis of motor nerves and muscles; but all these statements require further experiments.

Therapeutics of Acetanilid.

Externally.—[Acetanilid has been used in form of powder for soft and hard venereal ulcerations, in place of iodoform.]

Pyrexia.—This drug has been very largely used to reduce the temperature in fever. All physicians are agreed that when this is over 105° or 106° F. [40.5° or 41.1° C.], it is desirable to bring it down. In most cases this drug is the best means of doing this; but as it takes a little time to act, if the temperature is rising extremely rapidly, it is better to reduce it by means of a cold bath. Opinions are divided as to whether it is beneficial to reduce febrile temperatures of less than 105° F. [40.5° C.]. Probably if the fever lasts only a short time it is not necessary to reduce it, and therefore it is not usual to treat the short specific fevers as measles and scarlet fever with antipyretics. But if the fever last a long time, as in tuberculosis or typhoid fever, many hold that it is beneficial to give antipyretics to prevent the tissue waste entailed by the pyrexia. The practice is very common on the Continent, and fairly common in England. Some give the antipyretic if the temperature reaches 102° F. [38.8° C.], but a commoner point to choose, is 103° F. [39.4° C.]. Usually a single dose is given whenever the temperature, which is taken every two

or three hours, reaches the point fixed. It usually falls to about 99° or 100° F. [37.2° or 37 7° C.] soon after the administration of the drug. The balance of evidence is that toxicological symptoms are less common after acetanilid, which, however, does not keep the temperature down quite so long as [other antipyretics.] It takes about two hours to reduce the pyrexia to its minimum. [Acetanilid] may be given *per rectum*.

Analgesic action.—This drug has the property of relieving pain of neuralgia, sciatica, locomotor ataxia, migraine, and various headaches. [Under the name of Antikamnia a substance has been introduced which is probably a mixture of 20 parts of sodium bicarbonate, 70 of acetanilid and 10 of caffeine. Since acetanilid is a cardiac depressant, the addition of caffeine may be advantageous in some cases. A case of death has been reported, attributed to the ingestion of 24 grains [1.50 gm.] of this mixture.]

TOXICOLOGY.

Acetanilid occasionally produces in man collapse, cyanosis, very slow respiration, a feeble and irregular pulse, vomiting, profuse sweating, and profound prostration. [Death has occurred after a dose of 5 gr.; .30 gm.] It is not known whether these symptoms are due to impurities in the drug.

Treatment.—Stimulation by alcohol and ether, subcutaneously, and by the mouth. Strychnine subcutaneously to stimulate the heart. Warmth to the feet and body.

CLASS VI.—The Antiseptics.

Carbolic Acid, Sodium Sulphocarbolate, Creosote, Iodoform, Naphtol, Naphtalin and Resorcin.

[ACIDUM CARBOLICUM CRUDUM.

CRUDE CARBOLIC ACID.

SOURCE.—A liquid consisting of various constituents of coal-tar, chiefly cresol and phenol, obtained by fractional distillation between the temperatures of 302° and 392° F.; 150° and 200° C., and twice rectified between the temperatures of 338° and 374° F.; 170° and 190° C.

CHARACTERS.—A nearly colorless or reddish, or brownish-red liquid of a strongly empyreumatic and creosote-like odor, having a benumbing, blanching and caustic effect upon the skin and mucous membrane, and a slightly acid reaction.

Used only externally.]

I. ACIDUM CARBOLICUM.

CARBOLIC ACID.—C_6H_5OH [=93.78.] *Synonyms.*—Phenic Acid. Phenol. Phenyl Alcohol.

SOURCE.—[From Crude Carbolic Acid by agitation with warm concentrated solution of Soda, heating to 338° F.; 170° C., solution and treatment with Hydrochloric Acid. After being agitated with table salt, digested with Calcium Chloride, it is distilled between 336° and 374° F.; 168.8° and 190° C., and crystallized.]

CHARACTERS.—Colorless [interlaced or separate, needle-shaped crystals, or a white crystalline mass, sometimes acquiring a reddish tint, having a somewhat aromatic odor, and, when copiously diluted with water, a sweetish taste with a slightly burning after-taste. Treated with about 5 per cent. of water, it becomes fluid; the crystals are very hygroscopic, and hence soon become semi-fluid on exposure to air; it has a faintly acid reaction and coagulates albumin. *Solubility.*—In about 15 parts of water;] freely in Alcohol, fats and oils.

Dose, ½ to 1 gr.; [.03 to .06 gm.]

Preparations.

1. **Unguentum Ac di Carbolici.**—[Ointment of Carbolic Acid. Carbolic Acid, 5; Ointment, 95.

2. **Glyceritum Acidi Carbolici.**—Glycerite of Carbolic Acid. Carbolic Acid, 20; Glycerin, 80.

Dose, 2 to 5 m.; .12 to .30 c.c.]

ACTION.

External.—Carbolic acid is a powerful **antizymotic,** rapidly destroying organized ferments, both animal and vegetable. Consequently it destroys these of septic diseases, hence it is **antiseptic.** It thus prevents the formation of the products of the decompositions which are set up by these organisms. For this reason it is **disinfectant,** and as the products of decomposition are generally foul-smelling, it is **deodorant.** It does not act so readily on unorganized ferments (enzymes), such as pepsin and ptyalin, but in large doses it likewise destroys their activity. Carbolic acid is not so powerful an antizymotic as corrosive mercuric chloride (*see* p. 196); for Evans (Guy's Hospital Reports, vol. xlvii) found that anthrax spores were not killed in twenty-four hours by a solution of 1 in 100, but were killed by a solution of 1 in 20 acting for twenty-four hours, but not when it acted for only four hours. The bacilli of anthrax were killed by

solution of 1 in 100 acting for five minutes, 1 in 150 acting for a quarter of an hour, 1 in 175 acting for half an hour, but were unaffected by a solution of 1 in 150 acting for one minute, 1 in 175 acting for a quarter of an hour, 1 in 300 acting for an hour. Strengths of 1 in 40 and 1 in 20 are commonly employed in surgery. The solution in oil has no antiseptic properties. The power of carbolic acid to destroy low organisms makes it an efficient **parasiticide** against certain vegetable parasites infesting the skin.

When applied to the skin in weak or moderately strong solutions, it produces **local anæsthesia** with a feeling of numbness, which lasts some hours. If concentrated it acts as an **irritant** and **caustic**, causing a burning pain, and in a few minutes a white spot appears, which becomes red when the acid is removed. If the application is prolonged a white eschar or slough results. There is no vesication.

Internal.—*Gastro-intestinal tract.*—If concentrated, carbolic acid produces the same effect on the mouth as on the skin, and is a powerful gastro-intestinal irritant (*see* Toxicology). In the stomach it is converted into a sulphocarbolate, and unless poisonous doses be given, it is so diluted by the gastric contents that it loses its antizymotic power.

Blood.—It is not known in what form carbolic acid circulates, probably as an alkaline carbolate.

Circulation.—Medicinal doses have no effect. Large doses paralyze the vaso-motor centre in the medulla, and the blood-pressure falls. It is not until very large doses have been given that the heart is affected, and then its activity is depressed.

Respiration.—Small doses have no influence on respiration, but large ones accelerate it, probably from stimulation of the vagi. Ultimately respiration is paralyzed, and death results.

Temperature.—This is unaffected by small does of carbolic acid, but large doses cause it to fall, because they diminish the production of heat and increase its dissipation.

Nervous system.—Carbolic acid is a cerebral depressant in large doses, for coma is produced by them; they first stimulate

the anterior cornua, producing convulsions, but subsequently depress them, causing paralysis.

Urine.—Much interest attaches to this, for even after moderate doses of carbolic acid, or absorption from surgical dressings, **the urine may become dark.** This is not due to blood, as was once thought, for Stevenson has shown that there is no increase of iron in the urine. After taking carbolic acid, salts of sulphocarbolic acid, and glycuronic acid, pyrocatechin and hydroquinone appear in the urine. The last two are oxidation products of carbolic acid. Pyrocatechin is a dark-colored body, and is, no doubt, often the cause of the dark urine; but this cannot be the sole cause, for pyrocatechin can only exist in alkaline urine. The presence in the urine of these results of carbolic acid is recognized by distilling them over from it, [and the sulphates are usually absent.] The distillate gives a blue color with neutral ferric chloride, and a white crystalline precipitate of tribromophenol with bromine water, showing the presence of sulphocarbolic acid. Some carbolic acid escapes in the other excretions; some is burned up in the body. When very large doses are given carbolic acid itself may appear in the urine.

THERAPEUTICS.

External.—Carbolic acid is largely used as a deodorant and disinfectant for drains, bed-pans, soiled linen, surgical instruments, the surgeon's hands, etc. Carbolic lotion (1 in 40) is used to wash wounds to keep them antiseptic, and carbolized gauze (which is unbleached cotton gauze medicated with half its weight of a mixture of carbolic acid 1, resin 3, paraffin 4) is employed as a dressing for the same purpose. A spray of a solution of carbolic acid was formerly much used to keep the air around the wound antiseptic during an operation, but it is now discarded as unnecessary.

Glycerite of carbolic acid is a very efficient preparation to destroy the fungus of tinea tonsurans or tinea versicolor; for the latter it should be diluted.

Because of its anæsthetic effect a strong solution (1 in 20)

will relieve itching from any cause. Carbolized vapor has been inhaled in phthisis, but by the time it reaches the lungs it is far too dilute to have any action on the tubercle bacilli.

Internal.—*Mouth.*—The glycerite, if diluted, may be applied as a stimulant to the mouth in aphthous stomatitis, or when any indolent ulceration is present. A gargle (of [carbolic acid] in water, 1 in 120) is an excellent preparation. The glycerite has been used for diphtheria, but probably it does no good, except that being a local anæsthetic it soothes pain. A piece of cotton soaked in strong carbolic acid will relieve pain if placed in a decayed tooth, but care must be taken to prevent it from coming in contact with the soft parts by putting another piece of dry cotton over it.

Stomach.—Carbolic acid has been given to relieve flatulence, because it was thought that it would prevent decomposition in the stomach; but it is powerless to do this, owing to the degree to which the gastric contents dilute it. Some state that it checks vomiting and helps to cure dyspepsia, but it is not a remedy which is universally regarded as useful for these purposes. It may, however, be tried in obstinate cases. It has been given internally as an antiseptic in phthisis, but it does no good, and those who give it forget that probably very little carbolic acid reaches the lungs.

TOXICOLOGY.

If Carbolic Acid is at all concentrated, immediately on swallowing it there is an intense burning sensation in the mouth, [œsophagus] and stomach, and white eschars form in the mouth. The patient is collapsed, his skin is cold and clammy. The breathing becomes more and more feeble and shallow, and finally stops. The urine is darkish-green. Reflex movements are abolished, and ultimately he becomes insensible and comatose. *Post-mortem.*—There are white, hard sloughs, with perhaps inflammatory redness round them, in the mouth, œsophagus, and stomach. The blood is dark and coagulates imperfectly. In some cases fatty degeneration of the liver and kidneys may be found.

Treatment.—Any soluble sulphate, such as an ounce [30. gm.] of Magnesium Sulphate or half an ounce [15. gm.] of Sodium Sulphate dissolved in half a pint [250. c.c.] of water, is the natural antidote, because Sulphates and Carbolic Acid form Sulphocarbolates in the blood, and these are harmless. [redacted] antidote is given, wash out the stomach or use some very quickly

unusual. The stomach symptoms have been relieved by the patient placing himself upon his back, for half an hour after administration of the remedy. It is quite likely that the patient acquires a tolerance, for the daily dose of three hundred minims; 20. c.c. has been given for a considerable time with benefit, although fifty minims; 3.30 c.c. should be considered as the maximum daily dose. Creosote is more efficient than either of its principal constituents, guaiacol or creosol, even if given in proportionate dose. Creosote carbonate, which contains 92 per cent. of creosote, does not possess the caustic and irritative properties of the pure creosote, and can be administered in larger dose.]

IV. IODOFORMUM.

IODOFORM.—CHI_3[=392.56.]

SOURCE.—Heat together Alcohol, Iodine, Potassium Bicarbonate, and water. $C_2H_6O+4I_2+2KHCO_3=2CHI_3+2KI+3H_2O+2CO_2$.

CHARACTERS.—Small [lemon-yellow, lustrous crystals of the hexagonal system, having a peculiar, very penetrating and persistent odor somewhat resembling that of Saffron and Iodine, and an unpleasant, slightly sweetish, and Iodine-like taste. *Solubility.*—Very slightly in water; soluble in 52 parts of Alcohol; freely in fixed and Volatile Oils, Ether and Chloroform.] It contains more than 90 per cent. of Iodine.

Dose, 1 to 3 gr.; [.06 to .20 gm.]

Preparation.

Unguentum Iodoformi.—[Iodoform Ointment. Iodoform, 10; Benzoinated Lard, 90.]

ACTION.

External.—Iodoform is **antiseptic** and **disinfectant**, if we may judge by the results obtained in clinical practice; but the experimental evidence that it has no power to hinder the development of *Staphylococcus pyogenes*, *Bacillus subtilis*, and other micro-organisms, is very strong, for all, except one or two, experimenters state that it has no antiseptic properties. At present we have no explanation of these discrepancies. It is probable that much of its action is due to the free iodine that is given off from it, but in spite of this it is not irritant, but decidedly analgesic. It is readily absorbed from wounds.

Internal.—Not much is known about the internal action of iodoform. It is eliminated in all the secretions, but chiefly in the urine, as iodine, iodides, and iodates. They may be found in the urine for three days after administration of iodoform.

THERAPEUTICS.

External.—Iodoform is much used as a local stimulant, antiseptic and disinfectant. The clinical testimony as to its value is overwhelming.

Its anæsthetic influence diminishes the pain, if there is any, of the sores to which it is applied. It is an excellent application for all sorts of ulcers, sores and wounds, but especially for tuberculous and syphilitic ulcerations. Iodoform powder is usually [dusted] upon them. Wounds are often painted with a solution of it in collodion. This is an excellent application. Mixed with bismuth subnitrate, it is useful as an insufflation for ozæna, ulcers of the mouth and throat, and tuberculous ulcers of the larynx. It has been used in the form of a bougie for the urethra. The suppository [B. P., each 3 gr.; .20 gm., in 12 gr.; .80 gm. of oil of theobroma] is useful in painful conditions of the rectum. It is occasionally employed for pruritus, and to relieve the pain of neuralgia. Many attempts have been made to get rid of its odor; the best way is to dissolve it in volatile oil of camphor or balsam of Peru, or to add musk to it.

Internal.—Iodoform has not been found to be of any use internally. It has been tried unsuccessfully in phthisis and many other conditions.

TOXICOLOGY.

Curious symptoms, often severe and sometimes ending in death, are occasionally observed after the application of Iodoform to a raw surface. They are a quick pulse, gastro-intestinal irritation, fever, rapid collapse, melancholia, hallucinations, dilated pupils, extensive erythema and perhaps eczema. These symptoms vary much in severity, and it is rare for more than two or three of them to be present at once. Stimulants, diaphoretics and sponging the skin with warm water are recommended.

[V. NAPHTALINUM.

NAPHTALIN.—$C_{10}H_8$=127.7. *Synonym.*—Naphtalene.

SOURCE.—A Hydrocarbon obtained from Coal Tar by distillation between 356° and 482° F.; 180° and 250° C. The impure Naphtalin is treated successively with Sodium Hydroxide and Sulphuric Acid, and is purified by distillation in the presence of steam, and by treating with concentrated Sulphuric Acid and distilling.

CHARACTERS.—Colorless, shining, transparent laminæ, having a strong, characteristic odor resembling that of Coal Tar, and a burning aromatic taste; slowly volatilized on exposure to air. *Solubility.*—Insoluble in water; soluble in 15 parts of Alcohol, very soluble in Ether, Chloroform, Carbon Disulphide, and fixed or Volatile Oils.

Dose, 1 to 20 gr.; .06 to 1.20 gm.

ACTION AND USES.

As Naphtalin is not absorbed by the system, it acts only upon the mucous membrane of the bowels. It is a true intestinal antiseptic, and is of great value in dysentery, catarrhal, typhoid and tuberculous diarrhœa, when it markedly lessens or entirely abolishes the fœtor of the movements. It has also been used as a vermifuge. Success in the treatment of dysentery usually requires a daily dose of from one to two drachms; 4. to 8. gm., best administered in starch wafers with oil of bergamot.

VI. NAPHTOL.

NAPHTOL. — $C_{10}H_7OH = 143.66$. *Synonym.* — Beta-Naphtol. A phenol occurring in Coal Tar, but usually prepared artificially from Naphtalin.

SOURCE.—Concentrated Sulphuric Acid is allowed to act on Naphtalin whereby β–Naphtalin Sulphonic Acid is formed ($C_{10}H_7HSO_3$). This acid is dissolved in water, saturated with Milk of Lime, and the resulting Calcium Salt separated by crystallization. The crystals are redissolved in water and decomposed by Sodium Carbonate, yielding Sodium Naphtalin-Sulphonate ($C_{10}H_7SO_3Na$). The Sodium Salt is next added to fused Sodium Hydroxide and Sodium-Naphtol $C_{10}H_7ONa$, and Sodium Sulphite $NaSO_3$ is formed. The former is treated with Hydrochloric Acid and Naphtol is obtained, which is purified by sublimation and recrystallization from hot water.

CHARACTERS.—Colorless, or pale buff-colored, shining, crystalline laminæ, or a white, or yellowish white, crystalline powder, having a faint, phenol-like odor, and a sharp and pungent but not persistent taste. *Solubility.*—In about 1000 parts of water, and in 0.75 part of Alcohol; very soluble in Ether, Chloroform or solutions of Caustic Alkalies.

Dose, 1 to 20 gr.; .06 to 1.20 gm.

Action and Uses.

Naphtol was introduced as an antiseptic, at first in dermatological practice as a 10 per cent. ointment, in scabies, ringworm and psoriasis; it is, however, irritating in eczema. It is a remedy of great value in obtaining intestinal antisepsis, bacteriological investigations showing that it destroys certain micro-organisms, *in situ* when administered to the extent of 40 gr.; 2.70 gm. per day. As it is irritating to the stomach it can be administered in keratin-coated pills.

VII. RESORCINUM.

RESORCIN.—$C_6H_4(OH)_2$=109.74. *Synonyms.*—Resorcinol. Metadioxybenzol.

Source.—A diatomic phenol obtained by heating Benzene with fuming Sulphuric Acid, whereby Benzene Metadisulphonic Acid is formed ($C_6H_4(HSO_3)_2$). The acid is dissolved in water neutralized with Milk of Lime, the Calcium Sulphate expressed, Sodium Carbonate added, filtered and the filtrate evoporated to dryness. The residue is then heated with Caustic Soda and Sodium Resorcin ($C_6H_4(ONa)_2$) is formed; continuous boiling expels the Sulphurous Acid, and the residue is extracted with Ether and impure Resorcin obtained by distillation. This is purified by sublimation or recrystallization from water.

Characters.—Colorless or faintly reddish, needle-shaped crystals or rhombic plates, having a faint, peculiar odor, and a disagreeable, sweetish and afterwards pungent taste, acquiring a reddish or brownish tint by exposure to light and air. *Solubility.*—In 0.6 part of water, and in 0.5 part of Alcohol; also readily soluble in Ether or Glycerin; very slightly soluble in Chloroform.

Dose, 2 to 5 gr.; .12 to .30 gm.

Action and Uses.

This substance, originally introduced as an antipyretic, is now rarely employed for this purpose, as it is too depressant to the heart. A solution of resorcin in glycerin, 1 in 4, is excellent for removing epidermic scales in chronic skin diseases, and also for getting rid of the scales in seborrhœa sicca of the scalp. It is of great value in fermentative dyspepsia when administered, well diluted, one hour after ingestion of food.

Class VI.—The Remaining Carbon Compounds.

These have no relationship to each other, and each must therefore be considered [as] separated.

Hydrocyanic Acid and Petrolatum.

I. ACIDUM HYDROCYANICUM DILUTUM.

DILUTED HYDROCYANIC ACID.—HCN[=26.98. *Synonym.*—Prussic Acid. A liquid compound of 2 per cent., by weight, of absolute Hydrocyanic Acid, and 98 per cent. of water.]

Source.—Distil a mixture of Potassium Ferrocyanide, 20; Sulphuric Acid, 8; and water, 65, into distilled water. $K_4FeC_6N_6+2H_2SO_4=2K_2SO_4+H_4FeC_6N_6$. On the application of heat the Hydroferrocyanic Acid reacts with the remaining Potassium Ferrocyanide and Sulphuric Acid, and Hydrocyanic Acid distils over. $H_4FeC_6N_6+K_4FeC_6N_6+H_2SO_4=6HCN+K_2SO_4+K_2Fe(FeC_6N_6)$. The distillate is diluted with distilled water until the official strength is obtained. [Diluted Hydrocyanic Acid may also be prepared, extemporaneously, in the following manner: Mix Hydrochloric Acid, 5, with distilled water, 55; add the Silver Cyanide, 6, and shake the whole together in a glass-stoppered bottle. When the precipitate has subsided, pour off the clear liquid.] Scheele's Prussic Acid is a 4 or 5 per cent. solution.

Characters.—A colorless [liquid, of a characteristic odor and taste, resembling that of bitter almond]. Very unstable; to preserve it best, it should be kept in inverted blue-stoppered bottles. Old specimens may be inert.

Incompatibles.—Salts of silver, copper and iron, red mercuric oxide and sulphides.

Impurities. Sulphuric and hydrochloric acids.

Dose, 1 to 3 m.; [.06 to .20 c.c.]

Action.

External.—Hydrocyanic acid can pass through the epidermis, and then it paralyzes the terminations of the sensory nerves; thus it is a **local anæsthetic and sedative.** It is very rapidly absorbed from raw surfaces, and may cause poisoning if applied to them.

Internal.—*Alimentary tract.*—It is quickly absorbed by mucous membranes, and has the same anæsthetic and sedative effect on the mouth and stomach as on the skin. It must always be employed [well diluted]. A single drop of the pure acid placed

inside the eye of even a moderately large animal will kill it instantly.

Blood.—If death takes place almost immediately after the administration of the drug, all the blood in the body is a bright arterial tint; but if death does not occur for some little time (within half an hour), the blood is of a dark venous color. The primary transitory reddening of the venous blood is due to the fact that the hæmoglobin in it is oxidized; we do not know the cause of this. The subsequent darkening of the arterial blood is due to the fact that it has lost its oxygen, and contains carbon dioxide gas; why this should be is not certain, but probably it depends upon the asphyxia consequent upon the action of hydrocyanic acid on the respiratory centre. If blood be shaken up with [hydrocyanic] acid, after some time oxyhæmoglobin is converted into cyanohæmoglobin, the oxygen being turned out. [Hydrocyanic] acid added to drawn blood alters the shape of the red blood-corpuscles. Neither of these actions is seen in life, for sufficient [hydrocyanic] acid to cause them would kill before they could take place.

Heart.—Large doses cause instantaneous **diastolic arrest.** As this is also true if the drug is applied locally, we may conclude that large doses paralyze the heart directly. But [hydrocyanic] acid acts also on the cardiac centre in the medulla. A small dose will cause a slowing of the pulse from stimulation of the vagus centre, and the stoppage from larger doses is due both to the direct action on the heart and to that on the medulla.

Vaso-motor system.—The vaso-motor centre in the medulla is first briefly stimulated, but soon profoundly **paralyzed; blood-pressure** therefore falls **very low.**

Respiration.—The respiratory centre is **paralyzed** even more readily than the cardiac or vaso-motor centres, consequently the respirations quickly diminish both in force and frequency. Unless the heart has been instantaneously stopped by a large dose, asphyxia is the cause of death, and the heart goes on beating after the respirations have stopped. Occasionally, if the dose be small, all three centres may be at first very transitorily stimulated,

so that for a few seconds the pulse and respiration may be increased in frequency, and blood-pressure may rise

Nervous system.—Cerebrum.—Medicinal doses of [hydrocyanic] acid have no effect on the cerebrum. Toxic doses cause deep insensibility and coma. In man convulsions are rarely seen; in animals they are common. It is not known how far the coma and convulsions are due to the direct effect on the brain, the altered circulation through it, or the asphyxia.

Peripheral nerves and muscles—In animals dead of [hydrocyanic] acid poisoning these are unexcitable. This paralyzing effect is due to direct action on the nerves and muscles themselves, for it does not occur in the peripheral part of a limb if it is connected with the rest of the body only by its nerve. In this case, as no blood is circulating through the distal part of the limb, no [hydrocyanic] acid reaches it; but if the acid be applied locally to the severed limb, the nerve and muscles are paralyzed. This explains the local anæsthetic effect of [hydrocyanic] acid.

Shortly before death the spinal cord is paralyzed. The pupil is dilated. We do not know of any effect of [hydrocyanic] acid on the kidneys, nor how it is excreted.

Therapeutics.

External.—Lotions of a strength of about 1 to 48 of the diluted acid in water are valuable for allaying itching due to any cause. If the skin is abraded they must not be used.

Internal.—Small doses, 1 to 2 minims [.06 to .12 c.c.] of the diluted acid, are used for their sedative effect on the nerves of the stomach, to allay vomiting, and to relieve gastric pain, whatever be their cause, and often with good effect. A useful way of giving it is in an effervescent draught. [Since the effect of the remedy is transient, it should be given at frequent intervals.] It is a common ingredient of cough mixtures, for by its depressing effect on the central nervous system it diminishes reflex excitability, and is consequently most serviceable for a dry, hacking cough by means of which nothing is expectorated.

TOXICOLOGY.

With a large dose the symptoms usually begin in a few seconds; it is rare for them to be delayed more than two minutes. The patient is perfectly insensible; the eyes are fixed and glistening, the pupils dilated, the limbs flaccid, the skin cold and clammy. The respiration is slow, deep and convulsive; the pulse almost imperceptible. *Post-mortem.*—There may be an odor of [Hydrocyanic] Acid about the body, which is very livid. The fingers are clenched, the jaws firmly closed, and there is froth at the mouth; the eyes are fixed and glistening, and the pupils dilated. The stomach may be a little reddened; the blood is very dark.

Treatment.—Wash out the stomach immediately. If emetics are available, large doses must be given promptly, for every moment is important. Give Ether or Brandy and $\frac{1}{50}$ gr. [.0013 gm.] of Atropine subcutaneously. Use inhalations of Ammonia and artificial respiration.

[II. PETROLATUM.

1. PETROLATUM LIQUIDUM.—Liquid Petrolatum.

SOURCE.—A mixture of Hydrocarbons, chiefly of the Marsh-gas series, obtained by distilling off the lighter and more volatile portions from Petroleum, and purifying the residue when it has the desired consistence.

CHARACTERS.—A colorless, or more or less yellowish, oily, transparent liquid, without odor or taste, or giving off, when heated, a faint odor of Petroleum. Sp. gr., about 0.875 to 0.945. *Solubility.*—Insoluble in water; scarcely soluble in cold or hot Alcohol, or in cold Absolute Alcohol; but soluble in boiling Absolute Alcohol, and readily soluble in Ether, Chloroform, Carbon Disulphide, Oil of Turpentine, Benzin, Benzol, and fixed or volatile oils.

2. PETROLATUM MOLLE.—Soft Petrolatum. *Synonym.*—Soft Petroleum Ointment.

SOURCE.—A mixture of Hydrocarbons, chiefly of the Marsh-gas series, obtained by distilling off the lighter and more volatile portions from Petroleum, and purifying the residue when it has the desired melting point.

When Petrolatum is prescribed or ordered without further specification, Soft Petrolatum (Petrolatum Molle) is to be dispensed.

CHARACTERS.—A fat-like mass, of about the consistence of an ointment, varying from white to yellowish or yellow, more or less fluorescent when yellow, especially after being melted, transparent in thin layers, completely amorphous, and without odor or taste, or giving off, when heated, a faint odor of Petroleum. If a portion of Soft Petrolatum be liquefied, and brought to a temperature of 140° F.; 60° C, it will have a specific gravity of about 0.820 to 0.840. The melting point of Soft Petrolatum ranges between about 104° and 113° F.; 40° and 45° C.

[illegible] 0.850. The melting point of [illegible] 155° and 125° F.; 45° and 51.5° C.

IMPURITIES.—Fixed oils, fats of [illegible] organic impurities.

ACTION AN[illegible]

Petrolatum is used exclusively [illegible] and, because it does not become ra[illegible] stitute for fatty materials in ointm[illegible] difficulty it is not a good vehicle fo[illegible] the skin. Liquid petrolatum has b[illegible] application in inflammation of th[illegible] nose, throat, larynx and even of the[illegible] applied with an atomizer and may b[illegible] medicinal substances]

PART II.—ORGANIC MATERIA MEDICA.

SECTION I.—PHARMACOPŒIAL SUBSTANCES DERIVED FROM THE VEGETABLE KINGDOM.

THE drugs comprehended in this section may be arranged in many ways; but there are objections to each. Inasmuch as the medical student should be well acquainted with the actions of these drugs in health and disease, those which act similarly will be grouped together.

GROUP I.

Drugs acting chiefly on the Nervous System.

These may be classified as follows:

CLASS I.—Acting on the cerebrum.

A. Cerebral depressants or soporifics:

Opium, Hop, Lettuce.

B. Cerebral excitants:

Deliriants { **Belladonna.** **Stramonium.** **Hyoscyamus.** } Also act on nerve endings in glands and involuntary muscle.
Cannabis Indica.

Caffeine, Guarana.

CLASS II.—Acting on the spinal cord.

A. Exciting the cells of the anterior cornua. **Nux Vomica, Strychnine.**

B. Depressing the cells of the anterior cornua. **Calabar bean, Gelsemium.**

CLASS III.—Acting on the nerves.

A. Depressing the motor nerves. **Conium, Tobacco, Scutellaria.**

B. Depressing the sensory nerves. **Coca, Cocaine, Dulcamara.**

C. Stimulating the secretory nerves. **Pilocarpus.**

CLASS I.

OPIUM.

OPIUM.—[The concrete, milky exudation obtained by incising the unripe capsules of *Papaver somniferum* Linné (nat. ord. *Pap veraceæ*), and yielding, in its normal, moist condition, not less than 9 *per cent.* of crystallized morphine, when assayed. *Habitat.*—Western Asia; cultivated.]

terms Turkey and Levant Opium include th
more or less circular cakes, two or three i
reddish hue internally, covered with a leaf ex

COMPOSITION.—(1) *Alkaloids.*—At least
combined with Meconic Acid, some with Sul
Some Morphine Salts and Codeine are official.
ceine and Thebaine are important. The follo
in Opium:

Morphine [(2.5 to 22.8 per cent.).]	Hydroc
Codeine [(0.2 to 0.7 per cent.).]	Laudain
Thebaine [(0.15 to 1 per cent.).]	Laudano
Narcotine [(1.3 to 10 per cent.).]	Meconid
Narceine [(0.1 to 0.7 per cent.).]	Rhœadin
Papaverine [(1 per cent.).]	Codamin
Pseudomorphine [(0.2 per cent.).]	Gnoscopi
Protopine	Lanthopi
Oxynarcotine } [in minute quantity.]	[Deutero
Cryptopine	state

(2) *Neutral bodies.*—Two in number:

Meconin. M

(3) *Organic acids.*—Two in number. [Me

Meconic Acid. I

(4) *Water,* [*about*] 16 *per cent.*

(5) *Mucilage, resin.* [*portion*] —

of glucose in opium may cause it to explode when made into a pill with silver nitrate.

Dose, ¼ to 2 gr.; [.015 to .12 gm.]

[**OPII PULVIS.**—Powdered Opium. Opium dried at a temperature not exceeding 185° F.; 85° C., and reduced to a very fine powder.

Powdered Opium, for pharmaceutical or medicinal purposes, when assayed should yield not less than 13 nor more than 15 per cent. of Crystallized Morphine. Any Powdered Opium of a higher percentage may be brought within these limits by admixture with Powdered Opium of a lower percentage, in proper proportions.

Dose, ¼ to 2 gr.; .015 to .12 gm.

Preparations.

1. **Extractum Opii.**—Extract of Opium. Powdered Opium, 100; distilled water, 1000; Sugar of Milk, a sufficient quantity; by trituration, filtration and evaporation.

Dose, ⅛ to 1 gr.; .008 to .06 gm.

2. **Emplastrum Opii.**—Opium Plaster. Extract of Opium, 60; Burgundy Pitch, 180; Lead Plaster, 780; water, 80.

3. **Trochisci Glycyrrhizæ et Opii.**—Troches of Glycyrrhiza and Opium. Extract of Glycyrrhiza, 15; Powdered Opium, 0.5; Acacia, 12; Sugar, 20 gm.; Oil of Anise, 0.2 c.c. To make 100 troches. Each troche contains about $\frac{1}{12}$ gr.; .005 gm., of Opium.

Dose, 1 to 4 troches.

4. **Vinum Opii.**—Wine of Opium. *Synonym.*—Sydenham's Laudanum. Powdered Opium, 100; Cassia Cinnamon, 10; Cloves, 10; Alcohol, 150; White Wine to 1000; by maceration and filtration.

Dose, 3 to 20 m.; .20 to 1.20 c.c.

5. **Pilulæ Opii.**—Pills of Opium. Powdered Opium, 6.5; soap, 2 gm. To make 100 pills. Each pill contains 1 gr.; .06 gm. of Opium.

Dose, 1 to 2 pills.

6. **Pulvis Ipecacuanhæ et Opii.**—Powder of Ipecac and Opium. *Synonym.*—Dover's Powder. Powdered Opium, 10; Ipecac, 10; Sugar of Milk, 80.

Dose, 3 to 15 gr.; .20 to 1.00 gm.

7. **Acetum Opii.**—Vinegar of Opium. *Synonym.*—Black Drop. Powdered Opium, 100; Nutmeg, 30; sugar, 200; Diluted Acetic Acid to 1000; by maceration and percolation.

Dose, 3 to 20 m.; .20 to 1.20 c.c.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c

10. **Opium Deodoratum.**—Deo
Opium Denarcotisatum. Powdered O
cent. of Morphine), 100; macerated with
poured off, and macerated twice with Et
and mixed with Sugar of milk by triturat

Dose, ¼ to 2 gr.; .015 to .12 gm

11. **Tinctura Opii Deodorati.**—Ti
Powdered Opium, 100; Ether, 200; Alco
maceration with precipitated Phosphate, 50

Dose, 3 to 20 m.; .20 to 1.20 c.c.

12. **Tinctura Ipecacuanhæ et Op**
Opium. Tincture of Deodorized Opium,
cac, 100; diluted Alcohol to 1000. By e

Dose, 3 to 15 m.; .20 to 1.00 c.c.]

It will be noticed that from [*Extract of Opiu*
trum Opii, and from the *Deodorized Tincture*, Ti

The following list, in which the doses are arr

Name.	
—[Extractum Opii	⅛ to 1
—Pulvis Opii	¼ to 2
—Opium Deodoratum	
—Pulvis Ipecacuanhæ et Opii .	3 to 15
—Tinctura Ipecac et Opii] . . .	3 to 15
—Vinum Opii	

MORPHINA.—Morphine. [$C_{17}H_{19}NO_3 + H_2O = 302.34$.

SOURCE.—An Alkaloid obtained from Opium. Opium is macerated with distilled water, and strained, the infusion is evaporated and filtered. To the filtrate Alcohol and Water of Ammonia are added, and the Morphine crystallizes out. To purify the crystals, they are boiled with Alcohol, the solution filtered, when hot, through Animal Charcoal, and set aside to crystallize.

CHARACTERS.—Colorless or white, shining prismatic crystals, or fine needles, or a crystalline powder, having a bitter taste. *Solubility.*—In 4350 parts of water.]

Dose, ⅛ to ¼ gr.; [.008 to .015 gm.]

MORPHINÆ HYDROCHLORAS.—[Morphine Hydrochlorate. $C_{17}H_{19}NO_3HCl + 3H_2O = 374.63$.]

SOURCE.—(1) Take a cold concentrated watery solution of Opium, precipitate the meconic acid and resins with Calcium Chloride. The solution contains Morphine Hydrochlorate. (2) Evaporate the solution till it is solid, press to remove coloring matter, exhaust with boiling water, filter, and again evaporate and press; repeat this till the solution is nearly colorless. (3) Complete the decolorization by digesting with Charcoal. (4) Precipitate the Morphine with Ammonia and wash. (5) Dissolve in Hydrochloric Acid and crystallize out.

CHARACTERS.—White, feathery [needles of a silky lustre, or minute, cubical crystals, having a bitter taste. *Solubility.*—In 24 parts of water; in 62 of Alcohol.]

INCOMPATIBLES.—Salts of lead, iron, copper, mercury and zinc; alkaline carbonates; lime water; liquor potassii arsenitis; all substances containing tannin.

Dose, ⅛ to ¼ gr.; [.008 to .015 gm.]

MORPHINÆ ACETAS.—Morphine Acetate. [$C_{17}H_{19}NO_3C_2H_4O_2 + 3H_2O = 398.12$.]

SOURCE.—Morphine is precipitated with Ammonia from a solution of the Hydrochlorate. It is dissolved in Acetic Acid and water, and the solution is evaporated.

CHARACTERS.—A white, [or faintly yellowish-white, crystalline or amorphous powder, having a faint, acetous odor, and a bitter taste. *Solubility.*—In 2.5 parts of water; in 47.6 parts of Alcohol.] Many specimens are not so soluble as this.

Dose, ⅛ to ¼ gr.; [.008 to .015 gm.]

MORPHINÆ SULPHAS.—[Morphine Sulphate. $(C_{17}H_{19}NO_3)_2H_2SO_4 + 5H_2O = 756.38$.

SOURCE.—Morphine is dissolved in boiling distilled water; diluted Sul-

phuric Acid is added to neutralization, and on cooling the Sulphate appears in crystals.

CHARACTERS.—White, feathery, acicular crystals of a silky lustre, and having a bitter taste. *Solubility.*—In 2 parts of water; sparingly in Alcohol.

Dose, ⅛ to ¼ gr.; .008 to .015 gm.

Preparations.

1. **Pulvis Morphinæ Compositus.**—Compound Powder of Morphine. *Synonym.*—Tully's Powder. Morphine Sulphate, 1; Camphor, 19; Glycyrrhiza, 20; precipitated Calcium Carbonate, 20; Alcohol to 60. By trituration.

Dose, 5 to 15 gr.; .30 to 1.00 gm.

2. **Trochisci Morphinæ et Ipecacuanhæ.**—Troches of Morphine and Ipecac. Morphine Sulphate, 0.16; Ipecac, 0.50; Sugar, 65 gm.; Oil of Gaultheria, 0.2 c.c.; Mucilage of Tragacanth, a sufficient quantity to make 100 troches. *Strength*—About $\frac{1}{40}$ gr.; .0016 gm. of Morphine in each.

Dose, 1 to 5 troches.]

ACTION.

The action and uses of opium are due almost entirely to its morphine, and therefore they may be studied together.

External.—Opium probably has no action when applied to the unbroken skin, but it has been said to be slightly anodyne. It can be absorbed from and relieve the pain of raw surfaces.

Internal.—*Alimentary canal.*—Opium **diminishes** all the **secretions** of the body except the sweat. The mouth consequently becomes dry, and the patient feels thirsty, but after a small dose, not markedly so. This effect is partly due to the direct action of the opium on the mouth, but to a less extent to its influence exerted after it has been absorbed. In the stomach and intestines, by the same double action, the secretion of the gastric and intestinal juices is diminished. The drug also paralyzes the peristaltic movements of the stomach and intestines. This is due to stimulation of the centre of the nerves (splanchnics) which inhibit these movements. The result of the diminution of secretion and peristalsis is that opium appeases hunger, often causes **indigestion**, almost always gives rise to **constipa-**

tion, and if vomiting or diarrhœa is present, it will prevent it. These actions are also in part due to its general sedative influence on the nervous system. If pain exists in the abdomen or elsewhere, opium is a powerful **anodyne**. Most of it is absorbed, but rather slowly.

Blood.—Morphine for the most part circulates in the blood as such, and is excreted by the kidneys, but a small part of it is destroyed in the liver. The fate of the other alkaloids is not known, nor are we aware of any direct action of any of the constituents of opium on the blood itself.

Circulation.—In an ordinary healthy man small doses of opium do not affect the heart or vessels. Large doses first increase and then diminish the action of the heart, which finally stops in diastole. These effects can be produced by applying the drug to the organ; it therefore directly affects either the cardiac muscle or the nerves in it. But this local action is augmented by the less important influence of opium on the vagal centre; this is at first stimulated, and about the time at which the heart itself is depressed, so that both these actions make the **pulse slow**. Just before death the vagus is depressed, but the heart itself is by that time so feeble that the pulse is not quickened. Patients rarely die from the effect of opium on the heart and its nervous apparatus, this being much less important than the influence on respiration.

The vaso-motor system is not affected till towards the end of the symptoms due to toxic doses; then the vessels dilate from the action of the drug on the vaso-motor centres in the medulla and cord.

Respiration.—Opium is a **direct poison** to the **respiratory centre**. Breathing therefore becomes difficult, and death takes place from **asphyxia**.

Nervous system.—Brain.—The **higher faculties** are at first **excited** even by small doses. In a few persons there is no incoordination in this excitement. The intellectual power and mental vigor are increased, and therefore the drug is taken by some people to enable them to do their mental work. Usually, how-

the sleep is quite dreamless. This
depression of the highest centres,
of the others, the higher being i
that soon the sleeper does not re
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annul pain depends, of course, upo
amount is given, often there is no
the first symptom that opium has b
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Opium eaters take it for its stimul
cially as a hypnotic and anodyne.
this is due to the effect of the drug o
floor of the aqueduct of Sylvius. In
of the intellectual centres is brief, so i
centres—in fact, it is often difficult to
Their subsequent depression is never
intellectual faculties; for although th
weakness, and the patient always lies
about if he is supported. Vomiting
transient

The excitability of motor and sensory nerves is, perhaps, a little increased at first, but in the later stages of opium poisoning they are depressed, the sensory before the motor. The muscles remain irritable to the last.

Opium, in its action on the nervous system, illustrates the common fact that functions at first stimulated by a drug are usually subsequently paralyzed by it; and it affords an excellent example of the law of dissolution, for higher functions, such as the intellectual and imaginative, are first affected; motion is then disordered; next the pupillary centre, and then the medullary centres, for respiration and cardiac action are implicated. The spinal cord is influenced to a less degree, the nerves very slightly, and the muscles not at all.

In **man** the peculiarities of the action of morphine are its predominating influence on the higher mental functions, and the slight affection of the motor and the vaso-motor centres, the cord, the nerves, and the muscles. In **frogs** morphine produces violent convulsions, because its predominating action is to stimulate the spinal cord. **Birds** are peculiarly insusceptible to morphine. **Mammals** are for the most part affected in the same way as man, sleep and death from asphyxia being the leading symptoms; but in many of the lower mammals spinal symptoms are very marked.

Kidneys.—Sometimes opium slightly increases, sometimes it slightly decreases, the urinary flow.

Skin.—Opium is a mild **diaphoretic.**

Metabolism.—Opium depresses the biliary function of the liver, for the person taking it secretes less bile. If he has glycosuria, the amount of sugar he passes in the urine is diminished. General metabolism appears to be decreased also, for it is stated that the amounts of uric acid and carbon dioxide excreted are lessened, but some experimenters contradict this statement.

Peculiarities.—There are few drugs which have such different effects upon different people. The above description states the manner in which most human beings are affected; but in some the stage of excitation is very evident, so that they become deli-

an erythematous er

Differences in action beta

phine, being more readily a
especially suitable for subcuta
it acts very rapidly. (2) Opiu
tion and to cause constipation
the more valuable in many ab
the better diaphoretic. (4) I
action as an anodyne and soporifi
other powerful alkaloids in opiu
more powerfully in reducing the
urine in glycosuria.

THERAPE

External.--Hot fomentatio
laudanum are often applied to pai
heat and not the opium which re
Opii [B. P., tincture of opium an
rubbed into the skin diminishes th
and myalgia; probably in this cas
than the opium. Locally applie
soothe the pain due to them.
opium [B. P., powdered opium,
will often relieve the
a mild

forms of vomiting are relieved by morphine, because it relieves pain, peristalsis, and excessive secretion.

Intestines.—Opium is invaluable for stopping many varieties of diarrhœa. If they will yield to any treatment, opium is most likely to be successful. Intestinal colic, being due to irregular, excessive peristaltic action, is generally relieved by opium,—and so, indeed, is abdominal pain of all sorts. In all inflammatory conditions of the peritoneum full doses of opium must be given, the object being so to paralyze the intestinal movements as to prevent the peritoneal surfaces rubbing against each other. It is the great mainstay in perityphlitis, acute peritonitis, and after operations or wounds in the abdomen. Opium is far preferable to morphine for abdominal cases; if they are severe, it must be boldly pushed, the patient being kept just drowsy, with slightly contracted pupils; and it often does not matter if the bowels are not open for a month. [The more recent practice, however, is to keep the bowels slightly open by the use of the salines.]

Heart.—Much skill is required to give opium properly in heart disease. The hypodermatic injection of morphine is, on the whole, to be preferred to opium. The great indication for it is when cardiac pain and distress keep the patient awake. Often it acts like a charm, a quiet refreshing sleep being the result of a single injection. No doubt it is a cardiac depressant, but we have to set against this the exhaustion of pain and insomnia. Still, if the patient is very ill, these two factors must be carefully balanced. [It is quite probable that in small doses administered hypodermatically morphine is a cardiac stimulant.] It likewise often relieves the pain of aneurism and intra-thoracic growths. Its depressant effect may be to some extent counterbalanced by combining belladonna with it.

Vessels.—Opium is an excellent hæmostatic. It is probably efficient after absorption, but its great value is in intestinal hæmorrhage, when it acts partly by stopping peristaltic movements. An excellent form in which to give it is the Pilula Plumbi cum Opio, [B. P., powdered opium and confection of rose, of each, 1; lead acetate, 6 parts; dose, 3 to 5 gr.; .20 to .30 gm.]

risy. The liability to lividity and as
attended with cough must never be fo
quite inadmissible in the last stages of b
and, as a rule, in even the earlier stage
means of relieving the cough should be
is given, it must be administered with
ment. A "linctus opiatus," a favorite r
night when a cough keeps the patient aw
tincture of opium, 1; diluted sulphuric aci
to [30 parts]. The object of the treacle i
locally. Opium must also be given cau
there is in this disease a great liability to
nent opium habit.

Nervous system.—Brain.—It is in its
that the marvellous value of opium is s
being to relieve pain and to produce sleep
by pain. For these purposes it is best giv
morphine, for that acts more quickly, mor
liable to produce indigestion and exciter
would be a long list to give all the dise
can be relieved by morphine; cancer an
instances. Morphine is very valuable for
diseases; but it should never

biliary colic, and for the after-pains of a confinement. In these cases it relieves the pain partly from its power as an anodyne, and also because by its paralyzing effect on unstriped muscle it relaxes the muscular contraction. This property also makes it valuable in some cases of spasmodic stricture of the urethra. It may be given as a sedative in delirium tremens and some forms of mania, but often such large doses are required that its use is not justifiable. Patients suffering great pain can take enormous doses without any symptoms of poisoning.

Spinal cord.—It has been used for pains of locomotor ataxia and occasionally in convulsive diseases, but without much success.

Kidneys.—It should always be remembered that morphine is excreted with difficulty, if the kidneys are diseased. There are several cases recorded in which persons suffering from Bright's disease have been killed by quite small doses of opium.

Skin.—Combined with ipecacuanha [as in] Dover's powder, opium is commonly given as a mild diaphoretic, in cases of slight inflammatory disorder, such as a common cold.

Metabolism.—Opium is administered to persons suffering from diabetes, and the amount of sugar in the urine certainly diminishes and the patient's general health improves, [but, however, codeine is preferable]. Opium can, in the opinion of many, control all varieties of inflammation, therefore it is given for a cold in the head, for cystitis, pleurisy, etc. Occasionally persons taking opium suffer from retention of urine. We have indicated the occasions on which opium and morphine are respectively preferable.

Toxicology.

Acute poisoning.—There may be slight preliminary excitability; but soon drowsiness sets in. This is followed by incapacity for exertion, sleep, and finally deep coma. The pupils are minutely contracted. At first the patient can be roused; but soon no stimulation will do this. Reflex action is abolished. The skin is cold, the face and lips are livid, and towards the end bathed in sweat. The pulse is weak and slow. The respiration becomes slower and more irregular; and last it is stertorous, and the patient dies from asphyxia.

Diagnosis of poisoning by Opium.—1. *From Alcoholic poisoning.*—Often very difficult, especially if, as commonly happens, the man poisoned with

rise subsequently. If the pupils are unequal,
orrhage. 3. *From Carbolic Acid poisoning*, in
contracted pupils. The acid produces white
odor is characteristic. 4. *From Chloroform a*
of the breath and of the vomited matters. 5.
Bright's disease, especially albuminuria. 6. *F*
of the breath and the glycosuria. 7. *From t*
fit, by the history, the dilatation of the pupils,
does not deepen. 8. *From the same stage of a*
insane and other nervous diseases, by the same

Post mortem.—The appearances after dea
those always found after fatal asphyxia.

Treatment.—Wash out the stomach. Give
apomorphine [hydrochlorate] subcutaneously.
walking him about, flapping him with a towel, pin
current, and putting ammonia to the nose; a pin
jected into the rectum, $\frac{1}{20}$ gr., [.003 gm.] of Atro
ously, or 30 minims, [2. c.c.] of Tincture of Bell
every quarter of an hour. If the breathing is ver
should be employed. Amyl Nitrite inhalations
must be kept up for several hours if necessary.
been successfully used in an amount equal to th
almost immediately destroys the latter. It is cla
poison when in the blood so that a hypodermatic
hours after its ingestion may afford relief. Wood
hypodermatic injection does no good in morphin

these effects are due to action on the peripheral nerve terminations, while Morphine produces contrary results by acting on the central nervous system. Still it has been found that some of the undesirable effects that may follow the subcutaneous injection of Morphine, such as indigestion, constipation and cardiac depression, may be avoided if $\frac{1}{150}$ to $\frac{1}{100}$ gr., [.0004 to .0006 gm.] of Atropine Sulphate is injected at the same time.

CODEINA.—Codeine. An alkaloid obtained from Opium. [$C_{18}H_{21}NO_3 + H_2O = 316.31$.]

SOURCE.—Obtained by evaporating the ammoniacal liquids, remaining after the precipitation of Morphine by Ammonia in the preparation of the Hydrochlorate, treating the residue with water, precipitation with Caustic Potash, and purifying by dissolving in hot Ether and letting the Codeine crystallize out on spontaneous evaporation.

CHARACTERS.—White, or nearly translucent, [orthorhombic prisms, or octahedral crystals, having a faintly bitter taste, and slightly efflorescent in warm air. *Solubility.*—In 80 parts of water; in 3] of Alcohol.

Dose, ¼ **to 2 gr.; [.015 to .12 gm.]**

ACTION AND THERAPEUTICS.

It may produce tremors because it excites the cord more, and depresses the higher faculties less, than morphine. It is used to diminish the glycosuria in diabetes, [and as an analgesic. It is an excellent substitute for morphine as an ingredient of cough mixture. It is usually given as a pill, or in a syrupy solution.]

APOMORPHINÆ HYDROCHLORAS.—Apomorphine Hydrochlorate. $C_{17}H_{17}NO_2HCl$[$= 302.79$.]

SOURCE.—It is the hydrochlorate of an Alkaloid obtained by heating Morphine in sealed tubes with an excess of Hydrochloric Acid. The Morphine loses one molecule of water thus: $C_{17}H_{19}NO_3 = C_{17}H_{17}NO_2 + H_2O$.

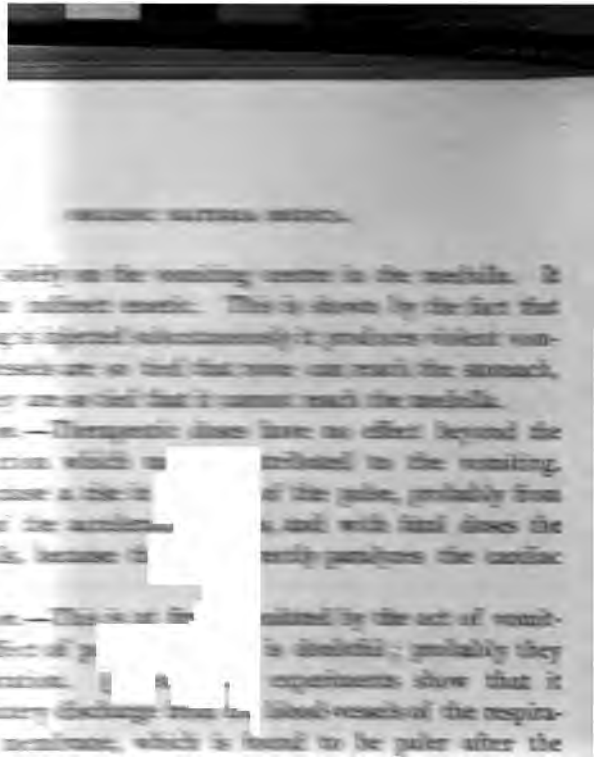
CHARACTERS.—[Minute, grayish-white, shining, acicular crystals, having a faintly bitter taste, and acquiring a greenish tint on exposure to light and air. *Solubility.*—In 45 parts of water; in about 45 parts of Alcohol.]

Dose, $\frac{1}{25}$ **to** $\frac{1}{6}$ **gr.; [.0027 to .01 gm.] hypodermatically,** $\frac{1}{20}$ **to** $\frac{1}{10}$ **gr.; [.003 to .006 gm.] by the mouth.**

ACTION.

External.—None.

Internal.—*Gastro-intestinal tract.*—Apomorphine is the most powerful **emetic** we possess. It does not act locally on the



[illegible] not solely on the vomiting centre in the medulla. It is therefore an indirect emetic. This is shown by the fact that when the drug is injected subcutaneously it produces violent vomiting if the vessels are so tied that none can reach the stomach, but not if they are so tied that it cannot reach the medulla.

Circulation.—Therapeutic doses have no effect beyond the [illegible] which is [illegible] to the vomiting. Large doses cause a rise in [illegible] of the pulse, probably from [illegible] of the medulla, and with fatal doses the pressure falls, because it [illegible] paralyses the cardiac muscle.

Respiration.—This is at first [illegible] by the act of vomiting. The effect of [illegible] is doubtful; probably they increase respiration. [illegible] experiments show that it produces a watery discharge from the blood-vessels of the respiratory mucous membrane, which is found to be paler after the administration of this remedy as well as its antimonious. This effect is produced when a dilute solution is injected into the blood-vessels, and it is not at all certain that the [illegible] is correct.

Mucous membranes.—The [illegible] of tartar [illegible] is to cause [illegible]. Finally, there is [illegible] of the motor nerves, and [illegible] of the muscles.

THERAPEUTICS.

Vomiting, acute.—The advantages of apomorphine over the other emetics are that it is certain, prompt, and powerful; it can be given when emetics introduced directly into the stomach would not act, and it does not irritate the stomach. It is largely used in cases of poisoning. It is usually given hypodermically, dissolved in [illegible] water [illegible] gr. Dose, 4 to 8 minims; [illegible] gr. This must be repeated subcutaneously, as it will not keep.

Expectorant action.—When given by the mouth, a valuable [illegible] of tartar is [illegible] gr., .002 gm., will produce a watery [illegible] than the time stated, and this effect will last from two to three hours. It is particularly

useful in the early stages of acute bronchitis, in chronic dry bronchitis, in chronic catarrhal pneumonia, and in old tuberculous patients who are harassed by an unproductive cough.]

HUMULUS.

HOPS.—The strobiles of *Humulus Lupulus* Linné (nat. ord. *Urticaceæ*). [*Habitat.*—Northern temperate zone; cultivated.]

CHARACTERS.—Ovate, about 3 cm. long, consisting of a thin, hairy, undulated axis, and many obliquely ovate, membranous scales, in the upper part reticulately-veined, and towards the base parallel-veined, glandular, and surrounding a subglobular achene; color of the scales greenish, free from reddish or brownish spots; odor, aromatic; taste, bitter, aromatic and slightly astringent.]

COMPOSITION.—The chief constituents are—(1) *Lupulin.* (2) *Lupulinic Acid*, 11 per cent., a bitter crystalline principle. (3) *Valerol*, 1 per cent., an aromatic volatile oil giving the odor. (4) Resin, 9 to 18 per cent. (5) Tannin, 3 to 4 per cent.

INCOMPATIBLES.—Mineral acids, and metallic salts.

Preparation.

Tinctura Humuli.—[Tincture of Hops. Hops, 200; by maceration and percolation with diluted Alcohol to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.]

LUPULINUM.—Lupulin. A glandular powder, separated from the strobiles of *Humulus Lupulus* Linné (nat. ord. *Urticaceæ*).

[CHARACTERS.—Bright, brownish-yellow, becoming yellowish-brown, resinous, consisting of minute granules, which, as seen under the microscope, are subglobular, or rather hood-shaped, and reticulate; aromatic and bitter.]

Dose, 5 to 30 gr.; .30 to 2.00 gm.

Preparations.

1. **[Extractum Lupulini Fluidum.**—Fluid Extract of Lupulin. Lupulin, 1000; by maceration and percolation with Alcohol, evaporation and solution to 1000 parts.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

2. **Oleoresina Lupulini.**—Oleoresin of Lupulin. Lupulin, 100; by percolation with Ether and evaporation.

Dose, 1 to 5 gr.; .06 to .30 gm.]

ACTION.

The volatile oil in hops is **stomachic** and **carminative** like other volatile oils. To a slight extent it reflexly excites the

circulation. The bitter principle aids the stomachic influence. Hops are decidedly **soporific.** Probably it is the volatile oil that produces this effect.

THERAPEUTICS.

The pharmacopœial preparations of hops are not much used, but good beer, because of the hops contained in it, may with some persons aid digestion, and for this purpose is often given with meals to those whose digestion is feeble after a long illness, or from any other cause. The alcohol in the beer increases this effect. Many people find the soporific influence of beer very well marked. [Hops have been used in dyspepsia, nervous tremors, wakefulness and in the delirium of drunkards.]

LACTUCARIUM.

[**LACTUCARIUM.**—The concrete milk-juice of *Lactuca virosa* Linné (nat. ord. *Compositæ*). *Habitat.*—Southern and Central Europe.

CHARACTERS.—In sections of plano-convex, circular cakes, or in irregular, angular pieces, externally grayish-brown or dull reddish-brown, internally whitish or yellowish, of a waxy lustre; odor heavy, somewhat narcotic; taste bitter.

COMPOSITION.—The chief constituents of Lactucarium are—(1) *Lactucerina or Lactucon*, $C_{16}H_{26}O$, about 50 per cent., a crystalline principle. (2) *Lactucin*, $C_{11}H_{12}O_3 + H_2O$, resembling mannit. (3) Lactucic Acid.

Dose, 5 to 60 gr.; .30 to 4.00 gm.]

Preparations.

[**1. Tinctura Lactucarii.**—Tincture of Lactucarium. Lactucarium, 500; Glycerin, 250; by treatment with Benzin and drying, macerate and percolate with water, and Alcohol; evaporate, filter and add diluted Alcohol to 1000.

Dose, ¼ to 2 fl. dr.; 1. to 8. c.c.

2. Syrupus Lactucarii.—Syrup of Lactucarium. Tincture of Lactucarium, 100; Sugar, 50; Precipitated Calcium Phosphate, 50; triturated together with water, filter, dissolve Sugar, 700; and add water to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

ACTION AND THERAPEUTICS.

[Lactucarium has been credited with mild hypnotic powers.

Large doses of the extract (B. P.) may cause mental derangement, and will dilate the pupil.]

BELLADONNA.

BELLADONNÆ FOLIA.—Belladonna Leaves. [The leaves of *Atropa Belladonna* Linné (nat. ord. *Solanaceæ*). *Synonym.*—Deadly Nightshade. *Habitat.*—Europe and Asia Minor.

CHARACTERS.—Leaves from 10 to 15 cm. long, from 5 to 10 cm. broad, broadly ovate, equilaterally narrowed into a petiole, tapering at the apex, entire on the margin, smooth, thin, the upper surface brownish-green, the lower surface, grayish-green, both surfaces whitish punctate; odor slight; bitterish, disagreeable.] *Resembling Belladonna leaves.*—Stramonium leaves, more wrinkled; hyoscyamus leaves, hairy.

COMPOSITION.—The chief constituents are—(1) *Atropine* (*q. v.*), [(2) *Belladonine*, a yellow powder is probably oxyatropine $C_{17}H_{23}NO_4$. *Probably it is identical with hyoscyamine* (*q. v.*); and *daturine* (*q. v.*), is a mixture of these, and they exist as malates in the plant.] Recently it has been stated that atropine does not exist in Belladonna in the natural state, but that it is a conversion product of hyoscyamine, which is the natural alkaloid of Belladonna.

Dose, 1 to 5 gr.; [.06 to .30 gm.]

Preparations.

1. **Extractum Belladonnæ [Foliorum Alcoholicum.**—Alcoholic Extract of Belladonna Leaves. By percolation with Alcohol and water, and evaporation.

Alcoholic Extract of Belladonna Leaves is used to make Emplastrum Belladonnæ and Unguentum Belladonnæ.

Dose, ⅛ to ½ gr.; .008 to .03 gm.

2. **Tinctura Belladonnæ Foliorum.**—Tinctura of Belladonna Leaves. Belladonna leaves, 150; diluted Alcohol, to 1000. By maceration and percolation.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

3. **Unguentum Belladonnæ.**—Belladonna Ointment. Alcoholic Extract of Belladonna Leaves, 10; diluted alcohol, 5; benzoinated lard, 85.

4. **Emplastrum Belladonnæ.**—Belladonna Plaster. Alcoholic Extract of Belladonna Leaves, 200; resin plaster, 400; soap plaster, 400. Melt the plasters on a water-bath; then add the extract of belladonna leaves and continue the heat, stirring constantly, until a homogeneous mass results.]

BELLADONNÆ RADIX.—Belladonna Root. The root of *Atropa Belladonna* [Linné (nat. ord. Solanaceæ)]. Habitat.—Central and Southern Europe, in waste.

Characters.—[In cylindrical, somewhat tapering, longitudinally wrinkled pieces, 10 to 25 mm. or more in thickness; externally brownish-gray, internally whitish; fracture nearly smooth and waxy, not radiating or showing medullary rays in the thicker roots, only in the layer near the bark; nearly inodorous; taste sweetish, afterwards bitterish and strongly acrid.]

Constituents.—In all the leaves. Usually contains 0.2 to 0.6 per cent. of atropine.

Preparations.

1. **Extractum Belladonnæ** [Radicis Fluidum.—Fluid Extract of Belladonna Root. By percolation with alcohol and water, and evaporation.

Dose, 1 to 3 m.; .06 to .20 c.c.

2. **Linimentum Belladonnæ.**—Belladonna Liniment. Fluid Extract of Belladonna Root, 95%; camphor, 5%.]

ATROPINA.—Atropine. $C_{17}H_{23}NO_3$ [=288.38. (Συκωνυος.—Atropia.) *An Alkaloid obtained from Belladonna. As it occurs in commerce, it is always accompanied by a small proportion of hyoscyamine extracted along with it, from which it cannot be readily separated.*]

Source.—The [B. P.] directs it to be made from the root thus:—(1) *Make a tincture of the root by maceration and percolation with Alcohol.* (2) *Add slaked lime; this splits up the Atropine Malate, Lime Malate being precipitated.* (3) Filter, and add Sulphuric Acid to precipitate the excess of *Lime.* (4) Filter, concentrate by distillation, partially evaporate, add Potassium Carbonate; after six hours much coloring matter is precipitated. (5) Filter, add more Potassium Carbonate; this sets free the Atropine. (6) Shake up with Chloroform, which takes up the Atropine in solution. (7) Withdraw the Chloroform, evaporate, and Atropine is left. It is purified by digestion with warm Alcohol and animal Charcoal.

Characters.—[White, acicular crystals, or a more or less amorphous, white powder, without odor, having a bitter, acrid taste, and gradually assuming a yellowish tint on exposure to air. *Solubility.*—In 130 parts of water, 3 parts of Alcohol, 16 parts of Ether, 4 parts of Chloroform, and about 50 parts of Glycerin.] It can be decomposed into Tropine and Tropic Acid, and reconstructed by their synthesis.

Incompatible.—Caustic alkalies decompose it.

Dose, $\frac{1}{100}$ **to** $\frac{1}{60}$ **gr.;** [.0005 to .001 gm.]

ATROPINÆ SULPHAS.—Atropine Sulphate. $[(C_{17}H_{23}NO_3)_2H_2SO_4$=674.58.

SOURCE.—Dissolve Atropine in dilute Sulphuric Acid, treat with Ether, the insoluble Sulphate is deposited.

CHARACTERS.—A white, indistinctly crystalline powder, having a very bitter nauseating taste. *Solubility.*—In 0.4 part of water; in 6.2 parts of Alcohol.]

Dose, $\frac{1}{120}$ **to** $\frac{1}{20}$ **gr.; [.0005 to .003 gm.]**

ACTION.

The action of belladonna and atropine is the same.

External.—Atropine placed by itself upon the unbroken skin cannot be absorbed, but rubbed in with substances which are absorbed, such as alcohol, glycerin, camphor, etc., applied to a broken surface, it paralyzes the terminations of the sensory nerves, especially if pain is present. It is thus a **local anæsthetic** and an **anodyne**. These are its chief actions, but to a much less extent it locally paralyzes the terminations of the motor nerves, first contracts and then dilates the vessels, and renders the secretions of the skin less active.

Internal.—*Gastro-intestinal tract.*—It will be convenient to describe the effects of belladonna on all secretions when speaking of its action on nerves, and we need not mention here its influence on the muscular coat of the intestine, for that is secondary to its action on the nervous system.

Blood.—Atropine is quickly absorbed, but does not affect the blood. Its main action is on the nervous system, and that must be considered in detail.

Secretory nerves.—The activity of the **peripheral terminations of all the secretory nerves** in the body is, as far as we know, **depressed.** These nerves fall under the following headings:

(*a*) *Mouth.*—Even small doses of atropine make the **mouth dry** from lack of saliva and mucus. In health, secretion of submaxillary saliva always follows stimulation of the chorda tympani nerve, and, as is well known, this is due to the fact that this nerve is the secretory nerve for this gland, and not to any vascular dilatation. If atropine be given to an animal, stimulation of the chorda no longer causes an increased flow of saliva, however

close to the gland the nerve is excited, the reason being that atropine has paralyzed the terminations of the chorda tympani. In the same way the terminations of the secretory nerves of the other salivary glands and the mucous glands are paralyzed, and hence the mouth is dry, because normal impulses cannot reach the cells of the glands.

Stomach, liver, and intestines.—We do not know what influence atropine has on the secretions of these organs.

Sweat glands.—Atropine paralyzes the terminations of the nerves in the sudoriparous glands. Thus it causes the **skin** to become **dry.**

Kidneys.—The effect of atropine on the amount of urine secreted is necessarily uncertain, as the urinary flow depends so much on the secretion of sweat.

Bronchial mucous membrane.—The secretion of **bronchial** and **tracheal mucus,** like that of the mouth, is **diminished.**

Mammary gland.—The activity of the peripheral terminations of the secretory nerves in the cells of the mammary gland is inhibited, hence the flow of **milk,** if any is present, is **arrested,** and belladonna is called an antigalactagogue.

Sensory nerves.—It has already been mentioned that belladonna rubbed into the skin depresses the function of the terminations of the sensory nerves. It does the same when given by the mouth, but its action on sensory nerves—that is to say, its anæsthetic and anodyne action—is very inferior to that on the secretory nerves, and is not powerful enough for atropine to relieve pain when given internally. It is only used as a local anodyne.

Voluntary muscles and their nerves.—Voluntary muscles are quite unaffected even by toxic doses of atropine; towards the end of a case of belladonna poisoning the motor nerves are slightly paralyzed.

Involuntary muscles and their nerves.—The splanchnics are the inhibitory nerves of the intestinal movements, and if they are stimulated the peristaltic movements stop; impulses are constantly descending these nerves to restrain these movements. If atropine

in small doses is given to animals it is observed that the bowels are relaxed, because intestinal **peristalsis** is much **increased,** and that stimulation of the splanchnics is powerless to arrest it; clearly the drug has paralyzed the terminations of the splanchnics in the involuntary muscles of the intestine. Some have found that very minute doses stop the peristaltic movements, others that large doses have this effect. Whether these results are due to stimulation of the terminations of the splanchnics is not known, nor is it easy to explain the discrepancies of the dose. In man it is most likely that moderate doses restrain excessive peristaltic action.

Probably the nerve terminations in the muscles of the bladder, urethra, vesiculæ seminales, uterus and vagina are affected in the same way as those in the intestinal muscles; but this is not yet decided.

The eye and its nerves.—Atropine acts only on the terminations of the nerves in the involuntary muscles of the eye. If it be dropped into the eye or given by the mouth the **pupil dilates widely,** and cannot be made to contract by stimulation of the third nerve. That this dilatation is not due to any action on the muscular fibres of the iris themselves is shown by the fact that the atropinized pupil will contract if the muscle itself be stimulated. Therefore it must be that the **terminations of the third nerve** in the iris **are paralyzed.** The ending of this nerve in the ciliary muscle is affected in the same way, and consequently **accommodation is paralyzed.** It is certain that this mydriasis and defective accommodation is in no part central, as is the contraction of the pupil produced by opium. So strong is the local action of belladonna, that if atropine be dropped into the recently excised eye the pupil will dilate. When the third nerve is cut the pupil dilates, and if, after this, atropine be dropped into the eye it dilates still further. Some have concluded, from this and other reasons, that atropine also stimulates the terminations of the sympathetic in the iris; but the reasoning is inconclusive, and it is not at present proved that atropine can do this. The intra-ocular tension is increased by large doses. There is, as a

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Vaso-motor system and its nerves.—
of belladonna the **skin is flushed**, an
matous rash may be

sels dilate. The action of atropine on the medullary vaso-motor centre is more marked than that on the cardiac medullary centre; but it is the same,—the centre first being stimulated, and then depressed. The primary stimulation is sufficient to overcome the tendency of the peripheral vessels to dilate, so that belladonna at first contracts them; and as this stage of contraction lasts well into the period during which, owing to paralysis of the vagal terminations, the heart is accelerated, the **blood-pressure rises** considerably: **subsequently it falls,** the fall being due to the depression of the vaso-motor centre and the peripheral action of belladonna on the vessels, causing their wide dilatation. Ultimately, when the heart itself is paralyzed, the blood-pressure is very low. The spinal vaso-motor centres are acted on as powerfully and in the same way as the medullary centre.

Respiration and its nerves.—Here also belladonna **paralyzes peripheral nerve-filaments,** in this case those of the vagus in the bronchial tubes. Both the afferent and efferent pulmonary vagal fibres are affected. The result is that the **muscular coat** of the bronchial tubes is **relaxed,** and that the secretions (the activity of the afferent fibres being depressed) do not irritate the nerves so much as before, and therefore cough is lessened. It will be remembered that the quantity of bronchial secretion is diminished. The medullary and spinal respiratory centres are influenced precisely as the vaso-motor,—that is to say, they are first stimulated, and so the respirations are quicker and deeper, then large doses paralyze them, and the breathing is slow and shallow. The patient becomes asphyxiated, and this contributes to the result in a fatal case.

Temperature.—This is decidedly **raised** by toxic doses of belladonna (it may be four degrees or more). This rise is independent of the blood-pressure and of the diminution of perspiration. It is said that heat-production is greatly exaggerated. The heat-loss is also increased, probably because the flushing of the skin leads to a greater loss by radiation.

Spinal cord.—Except for the action on the vaso-motor and respiratory spinal centres, belladonna has little influence on the

spinal cord in man, but has a well-marked tetanizing effect in frogs. It is said slightly to increase and afterwards diminish general reflex excitability.

Cerebrum.—A considerable dose of belladonna causes **delirium**, showing that the higher centres are stimulated. Generally the stimulation takes place inco-ordinately. That it is powerful is indicated by the fact that in poisoning by belladonna the delirium will last for a long while. The subsequent quietude is not more than the exhaustion of the cerebrum from the continued delirium will explain. Belladonna rarely, if ever, produces genuine coma. Other symptoms that may be observed with large doses, and which are probably due to disorder of the brain, are staggering gait, giddiness and occasionally convulsions.

Elimination.—Atropine is probably eliminated entirely by the kidneys.

It will be seen that the **dominant action** of belladonna is to **depress** the activity of the terminations of nearly **all varieties of nerves**. In addition, it **first stimulates** and **then depresses** the **three great medullary centres**, and it is a deliriant. A summary of its effects on man will be given under the heading of Toxicology.

Children can take considerable doses of belladonna without any symptoms of poisoning. Pigeons and rodents are peculiarly insusceptible to it.

THERAPEUTICS.

Externally.—Belladonna is used externally to relieve all sorts of pain,—for example, that of neuralgia, pleurodynia, and chronic osteo-arthritis. The liniment is excellent for these purposes. A glycerin preparation (made by rubbing [the alcoholic] extract of belladonna [leaves], 4; with boiling water, 1; and then adding gradually glycerin, 12), soothes the pain of acute inflammations. This, or the plaster, or the ointment, is very efficacious in preventing the secretion of milk in women who do not for any reason nurse their infants. Pruritus and local sweating of various parts of the body, especially the feet, may sometimes be stopped by the application of belladonna. A solution

of atropine sulphate in camphor water, 1 in 120; will dilate the pupil for ophthalmoscopic examination. Atropine is often used in ophthalmic practice to paralyze the movements of the iris and ciliary muscles, to break down adhesions, and to prevent the formation of contractions of the iris. *See* also Homatropine [Hydrobromate].

Internal.—*Alimentary canal.* Belladonna has occasionally been employed to check salivation, and some use it to overcome constipation and colic. The extract is then given, and is commonly combined with some purgative in a pill. [The alcoholic] extract of belladonna [leaves] is often administered with opium in the form of a pill to patients suffering with typhlitis or peritonitis; as it is given several times a day a large amount is taken, and this, as already explained, probably paralyzes intestinal movements, and so aids the opium.

Skin.—Atropine sulphate ($\frac{1}{100}$ gr.; .0006 gm.) injected subcutaneously, or one or two minims [.06 to .12 c.c.] of the solution of Atropine Sulphate [1, in camphor water, 100.], by the mouth will sometimes arrest sweating, and this treatment may succeed with the night sweats of phthisis.

Circulation.—There are many cases of heart disease in which belladonna may advantageously be combined with other drugs. Whenever we wish to empty the ventricle completely it is useful, for it will be remembered that it increases the rapidity of the heart without diminishing the force. But its greatest value is to remove cardiac pain and distress, which it often does most effectually. It may be conveniently applied as a plaster over the cardiac region, or it may be given internally, usually as the tincture [of the leaves].

Respiration.—As belladonna relaxes the muscular coat of the bronchial tubes, it is of great value in spasmodic affections of the respiratory passages. Thus, of all the numerous drugs that have been given for whooping-cough, it is the best. It is also very useful [to relieve the symptom of] asthma, and in bronchitis with asthma-like paroxysms; in the last-named [condition] its powerful stimulation of the respiratory centre and its capability

of diminishing the secretion will, in properly chosen cases, render it particularly valuable. It is generally given as a tincture [of the leaves], and combined with other drugs.

Genito-urinary diseases.—Belladonna is one of the favorite remedies for the nocturnal incontinence of children, and it occasionally overcomes this trouble in adults when it is not due to organic diseases. Its power of relieving the spasm of involuntary muscle is well shown in the effectual manner in which the very painful vesical spasm which accomplishes calculus, cystitis, and prostatitis may be benefited by it. It may be given internally as in the form of a suppository, or applied as a plaster to the perinæum.

It has been tried in many nervous diseases, but without any good results.

Toxicology.

If a person takes a moderate dose of Belladonna he soon experiences dryness of the mouth and throat, and as the food, therefore, cannot be properly lubricated, there is difficulty of swallowing; the pulse may at first be a little slower than usual. The pupil is dilated; accommodation is defective, and vision confused. The skin feels dry. If the dose has been a large one, these symptoms all come on quickly; the conjunctivæ and face, and perhaps other parts of the skin are flushed, and the rate of the pulse is greatly increased, it may even be doubled. The patient staggers, feels giddy, and reels when he walks; the throat soon becomes very hot, the skin still more flushed, the eyelids swell, and there may be a uniform erythematous rash. The temperature is often raised, the respirations are slow and deep. The pupils are very widely dilated. By this time the patient is quite delirious. There may be purging, but this is not common; and sometimes he complains of a frequent desire to micturate, although he is unable to pass any urine. Death takes place from cardiac failure combined with asphyxia. *Post-mortem.*—The organs are all in a state of venous congestion, which is due to the asphyxia. If recovery takes place the patient may have no recollection of his illness.

Treatment.—Give emetics (*see* p. 128) or wash out the stomach. Inject Pilocarpine and stimulants subcutaneously. Employ artificial respiration.

Antagonism.

The antagonism between atropine and morphine has already been discussed (*see* p. 310). It is clear that as *pilocarpine* stimulates the terminations of the secretory nerves in the salivary and sweat glands, and also excites the terminations of the third nerve in the iris and ciliary muscle, it is a diaphoretic,

a sialagogue, and a myotic, and is in these respects antagonistic to Atropine. *Physostigmine* also causes contraction of the pupil and spasm of the ciliary muscle by stimulation of the terminations of the third nerve, and it depresses the respiratory centre almost from the beginning. In these points it is an antagonist to Atropine.

STRAMONIUM.

STRAMONII SEMEN.—Stramonium Seed. [*Synonym.*—Thorn-apple seed. The seed of *Datura Stramonium* Linné (nat. ord. *Solanaceæ*). *Habitat.*—Asia; naturalized in most countries.

CHARACTERS.—About 4 mm. long, reniform, flattened, pitted and wrinkled; testa dull, brownish-black, hard, inclosing a cylindrical, curved embryo, imbedded in a whitish, oily perisperm; of an unpleasant odor when bruised, and of an oily and bitter taste.]

COMPOSITION.—The chief constituents are—(1) *Daturine*, a mixture of Hyoscyamine and Atropine [(0.3 per cent.); (2) *Scopolamine;* (3) A fixed oil (25 per cent.), which contains *Daturic Acid*, $C_{17}H_{34}O_2$.]

INCOMPATIBLES.—Caustic alkalies, metallic salts, and mineral acids.

Dose, 1 to 3 gr.; [.06 to .20 gm.]

Preparations.

1. **Extractum Stramonii [Seminis.**—Extract of Stramonium Seed. By maceration and percolation with diluted Alcohol, and evaporation.

Extract of Stramonium Seed is used to prepare Unguentum Stramonii.

Dose, ¼ to ½ gr.; .015 to .03 gm.

2. **Extractum Stramonii Seminis Fluidum.**—Fluid Extract of Stramonium Seed. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 1 to 3 m.; .06 to .20 c.c.

3. **Tinctura Stramonii Seminis.**—Tincture of Stramonium Seed. Stramonium Seed, 150; diluted Alcohol, by maceration and percolation to 1000.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

4. **Unguentum Stramonii.**—Stramonium Ointment. Extract of Stramonium Seed, 10; diluted Alcohol, 5; Benzoinated Lard, 85.]

STRAMONII FOLIA.—Stramonium Leaves. The [leaves of *Datura Stramonium* Linné (nat. ord. *Solanaceæ*).

CHARACTERS.—About 15 cm. long, petiolate, dark-green, smooth, ovate, pointed, unequal, especially at the base, coarsely and sinuately toothed; thin, brittle, and nearly inodorous; taste unpleasant, bitter and nauseous.] *Resem-*

bling Stramonium Leaves.—Belladonna leaves, but less wrinkled; hyoscyamus leaves, hairy.

COMPOSITION.—As of the seeds; the proportion of *Daturine* [is about 2 per cent.

Dose, 1 to 5 gr.; .06 to .30 gm.]

ACTION.

The physiological action of daturine is that of [a mixture of hyoscyamine and] atropine, and therefore that of stramonium is almost the same as that of belladonna; the differences being that stramonium relaxes the muscular coat of the bronchial tubes more powerfully than belladonna, and it may cause the heart to be a little irregular.

THERAPEUTICS.

There is no reason why stramonium should not be employed for the same purposes as belladonna, but it is rarely used, except in cases of asthma, to relieve the spasm of the bronchial tubes. For this it is very valuable. Cirgarettes of the leaves may be smoked, or the drug may be given internally. The following powder, which gives off dense fumes if burnt, is said to afford great relief for asthma:—Leaves of Datura Stramonium, Datura Tatula [not official], Cannabis Indica, and Lobelia Inflata, all in powder, of each 12; nitre in powder, 16; oil of eucalyptus, 1. Mix thoroughly.

HYOSCYAMUS.

[**HYOSCYAMUS.**—*Synonym.*—Henbane. The leaves and flowering tops of *Hyoscyamus Niger* Linné (nat. ord. *Solanaceæ*) collected from plants of the second year's growth. *Habitat.*—Europe and Asia; naturalized in some parts of North America.

CHARACTERS.—Leaves ovate, or ovate-oblong, up to 25 cm. long and 10 cm. broad; sinuate-toothed, the teeth large, oblong or triangular; grayish-green and, particularly on the lower surface, glandular-hairy; midrib prominent; flowers nearly sessile, with an urn-shaped, five-toothed calyx, and a light yellow purple-veined corolla; odor heavy, narcotic; taste bitter and somewhat acrid.]

COMPOSITION.—The chief constituents are—(1) *Hyoscyamine*, $C_{17}H_{23}NO_3$, an alkaloid. It is also contained in many plants of the natural order *Solanaceæ*. According to most authorities it, like Atropine, consists of Tropic Acid

and Tropine. There is in commerce an amorphous impure Hyoscyamine, which is a dark brown extract-like fluid having a disagreeable odor. As it is much cheaper than the crystalline alkaloid it is often used. (2) *Hyoscine*, a white crystalline alkaloid. It is most likely a derivative of Hyoscyamine. It is the active constituent of commercial Hyoscyamine. Only its salts are used.

INCOMPATIBLES.—Vegetable acids, silver nitrate, lead acetate, and alkalies.

Dose, 5 to 15 gr.; [.30 to 1.00 gm.]

Preparations.

1. **Extractum Hyoscyami.**—[Extract of Hyoscyamus. By maceration and percolation with diluted Alcohol and evaporation.

Dose, ½ to 2 gr.; .03 to .12 gm.]

2. **Extractum Hyoscyami Fluidum.**—[Fluid Extract of Hyoscyamus. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 5 to 15 m.; .30 to 1.00 c.c.]

3. **Tinctura Hyoscyami.**—[Tincture of Hyoscyamus.—Hyoscyamus, 150; diluted Alcohol to 1000. By maceration and percolation.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

[HYOSCYAMINÆ SULPHAS.—Hyoscyamine Sulphate. $(C_{17}H_{23}NO_3)_2H_2SO_4 = 674.58$. The neutral sulphate of an Alkaloid prepared from Hyoscyamus.

SOURCE.—Hyoscyamus seed is treated with Ether, to remove fat, then with Alcohol acidulated with Sulphuric Acid and distilled. The aqueous residue is neutralized with Soda, and the liquid precipitated with Tannin, the precipitate mixed with Lime, then exhausted by strong Alcohol. The Alcoholic solution is treated with Sulphuric Acid, then with Soda and finally with Ether, which dissolves the alkaloid, which is obtained from it by distillation.

CHARACTERS.—White, indistinct crystals, or a white powder, without odor, and having a bitter, acrid taste; deliquescent in damp air. *Solubility.*—In 0.5 part of water, and in 2.5 parts of alcohol; very slightly soluble in Ether or Chloroform.

Dose, $\frac{1}{60}$ to $\frac{1}{30}$ gr.; .001 to .002 gm.

HYOSCYAMINÆ HYDROBROMAS.—Hyoscyamine Hydrobromate. $C_{17}H_{23}NO_3HBr = 369.14$. The hydrobromate of an alkaloid obtained from Hyoscyamus.

CHARACTERS.—A yellowish-white, amorphous, resin-like mass, or prismatic crystals, having, particularly when damp, a tobacco-like odor, and an

acrid, nauseous, and bitter taste; deliquescent on exposure to air. *Solubility.*—In about 0.3 part of water, 2 parts of Alcohol, 3000 parts of Ether, or 250 parts of Chloroform.

Dose, $\frac{1}{60}$ **to** $\frac{1}{30}$ **gr.; .001 to .002 gm.**

HYOSCINÆ HYDROBROMAS.—Hyoscine Hydrobromate. $C_{17}H_{21}NO_4HBr + 3H_2O = 436.98$. The Hydrobromate of an alkaloid obtained from Hyoscyamus.

CHARACTERS.—Colorless, transparent, rhombic crystals, odorless, and having an acrid, slightly bitter taste; permanent in the air. *Solubility.*—In 1.9 parts of water, and in 13 parts of Alcohol; very slightly soluble in Ether or Chloroform.

Dose, $\frac{1}{150}$ **to** $\frac{1}{100}$ **gr.; .0004 to .0006 gm.**

ACTION.

The action of hyoscyamus is almost identical with that of belladonna and stramonium, because of the identity of the hyoscyamine in hyoscyamus, the atropine in belladonna, and the daturine [a mixture of atropine and hyoscyamine] in stramonium. The following are the chief points of difference: (1) Hyoscyamus contains in addition **hyoscine** in minute quantities. This is a powerful **cerebral** and **spinal sedative,** and therefore the excitation and delirium occasioned by the atropine in belladonna are not so evident when hyoscyamus is given; indeed, that may, owing to the hyoscine in it, distinctly depress the higher functions of the brain. The heart is not quite so powerfully affected by hyoscyamus as by belladonna, for hyoscine has a comparatively feeble cardiac influence. Still it is, of course, affected by the hyoscyamine, which acts like atropine. (2) **Hyoscyamus increases the peristaltic contractions** of the intestines more powerfully than belladonna, and at the same time it is more efficient in **relieving the griping** of other purgatives. (3) **Hyoscyamus** has a **more** markedly **sedative** action on the **urinary unstriped muscle** than belladonna.

THERAPEUTICS.

Hyoscyamus might be used for the same purposes as belladonna, but is chiefly employed in combination with purgatives to

diminish their griping action. It is also largely given to relieve vesical spasm in calculus, cystitis, and prostatitis, usually in conjunction with other urinary sedatives, as buchu, uva ursi, or benzoic acid if the urine is alkaline. It will be noticed that the doses of the preparations of hyoscyamus are larger than those of the corresponding preparations of belladonna.

Hyoscine and commercial hyoscyamine may, if given cautiously, be employed as cerebral depressants, and are used in acute mania, delirium tremens, febrile delirium, and insomnia, sometimes with good results. They are mostly given in asylum practice. Chorea, paralysis agitans, and other convulsive diseases have been treated with them, but the convulsions always recur when these drugs are discontinued.

CANNABIS INDICA.

[**INDIAN CANNABIS.**—*Synonym.*—Indian Hemp. The flowering tops of the female plant of *Cannabis sativa* Linné (nat. ord. *Urticaceæ*), grown in the East Indies. *Habitat.*—Asia; collected in India.

CHARACTERS.—Branching, compressed, brittle, about 5 cm. or more long, with a few digitate leaves, having linear-lanceolate leaflets and numerous, sheathing, pointed bracts, each containing two small, pistillate flowers, sometimes with the nearly ripe fruit, the whole more or less agglutinated with a resinous exudation. It has a brownish-green color, a peculiar, narcotic odor, and a slightly acrid taste.

COMPOSITION.—The chief constituents are—(1) *Cannabinon*, [a soft resin. (2) *Choline*, $C_5H_{15}NO_2$, which is contained in (3) *Tetanocannabine*, and with alkalies gives (4) *Cannabinine*. (5) *Cannabin*, a brown, amorphorous resin,] said to be very active.

INCOMPATIBLE.—Water, which precipitates the resin.

Dose, 2 to 5 gr.; [.12 to .30 gm.]

Preparations.

1. **Extractum Cannabis Indicæ.**—[Extract of Indian Cannabis. By maceration and percolation with Alcohol, and evaporation.

Dose, ⅙ to ¼ gr.; .01 to .045 gm.

2. **Extractum Cannabis Indicæ Fluidum.**—Fluid Extract of Indian Cannabis. By maceration, percolation with Alcohol, which is distilled off, and evaporation.

Dose, 2 to 5 m.; .12 to .30 c.c.

3. **Tinctura Cannabis Indicæ.**—Tincture of Indian Cannabis, Indian Cannabis, 50; Alcohol, by maceration and percolation, to 1000. **Dose, 5 to 30 m.; .30 to 2.00 c.c.**]

Synonym.—Haschisch is a confection of the drug. Gunjah, or Ganga, is the dried leaves prepared for smoking. Churrus is the Resin scraped off the leaves.

Action.

External.—None is known.

Internal.—The effects of Cannabis Indica vary very much on different people. This is partly due to the uncertain strength of the preparations of the drug, and partly to individual peculiarities, but generally the symptoms are somewhat as follows. After some time, usually from half an hour to two or three hours, there is a pleasurable sensation of mild intoxication; the patient is particularly gay, joyous, and pleased with everything; he will laugh and smile on the slightest provocation, and is himself able to say sharp, witty things. Pleasant ideas flit through his mind with wonderful rapidity, so that time seems to him much [prolonged; space also seems to be extended]. Generally the ideas are quickly forgotten, but sometimes the memory of them remains after recovery. The eyes are bright, the pupils may be dilated. The limbs feel heavy, and there is a marked lowering of general sensibility, so that he scarcely feels a severe pinch; this may pass on to complete anæsthesia. There may be headache. After a time sleep, which is often accompanied by delightful dreams, comes on. [On awakening the sense of hunger is acute.] The drug is frequently taken in the East to produce the early pleasurable symptoms, but this habit is said to lead to loss of appetite and strength, trembling and much weakness. Cannabis Indica is reputed to occasionally produce sexual excitement, but this is probably incorrect. No details about its physiological action are known.

Therapeutics.

It has been given with success in migraine and neuralgia, but it very often fails to afford relief. Its use as an hypnotic has been discarded. The tincture is very difficult to prescribe, be-

cause of the voluminous precipitate of resin which falls on the addition of water. Mucilage must be used to suspend it, and the taste should be covered with Spirit of Chloroform.

CAFFEINA.

CAFFEINE. — $C_8H_{10}N_4O_2 + H_2O = 211.68$. *Synonyms.* — Theine. Guaranine. [A feebly basic, proximate principle, obtained from the dried leaves of *Thea sinensis* Linné (nat. ord. *Ternstræmiaceæ*), or from the dried seed of *Caffea arabica* Linné (nat. ord. *Rubiaceæ*), and found also in other plants. *Habitat.*—Tropical Africa; cultivated in tropical countries.

SOURCE.—Exhaust bruised coffee by successive portions of boiling water, precipitate with Lead Acetate, decompose the excess of Lead Acetate in the filtrate by Hydrogen Sulphide, concentrate by evaporation, neutralize with Ammonia. The Caffeine crystallizes on cooling, and is purified by redissolving in water, treating with Animal Charcoal, and evaporation.]

CHARACTERS.—[Fleecy masses of long, flexible, white crystals, possessing a silky lustre, without odor, having a bitter taste, and permanent in the air. *Solubility.*—In 80 parts of water, 33 parts of Alcohol, 555 parts of Ether, or 7 parts of Chloroform] Tea contains 3 to 5 per cent. (hence the name Theine) Coffee, 1.3 per cent. (coffee leaves contain much more). Guarana (the seeds of *Paullinia* [*cupana*]), [4 to] 5 per cent. (hence the name guaranine). Maté (Paraguay tea, the leaves of *Ilex paraguayensis*), 1.2 per cent. It also exists in the kola nut (which is used as a beverage in Africa); this is the fruit of *Sterculia acuminata.* Caffeine is trimethyl-xanthine, theobromine is dimethyl-xanthine, and both can be prepared synthetically from xanthine.

INCOMPATIBLES.—Potassium iodide, mercury salts, and tannic acid.

Dose, 1 to 5 gr.; [.06 to .30 gm.]

Preparations.

[1. **Caffeina Citrata.**—Citrated Caffeine. Dissolve Citric Acid, 50, in hot distilled water, 100; add the Caffeine, 50, and evaporate the resulting solution on a water-bath to dryness, constantly stirring towards the end of the operation. Reduce the product to a fine powder.

CHARACTERS.—A white powder, odorless, having a purely acid taste and an acid reaction. *Solubility.*—One part of Citrated Caffeine forms a clear, syrupy solution with about 3 parts of water.

Dose, 2 to 8 gr.; .12 to .50 gm.

2. **Caffeina Citrata Effervescens.**—Effervescent Citrated Caffeine. Caffeine, 10; Citric Acid, 10; Sodium Bicarbonate, 330; Tartaric Acid, 300; Sugar, 350; Alcohol, to make 1000. Triturate the solid ingredients, separately well dried, to a fine uniform powder.

Mix this with Alcohol to a soft paste and rub it through a sieve. Then dry it, and reduce it to a coarse, granular powder.

Dose, 1 to 4 dr.; 4. to 15. gm.]

ACTION.

External.—None.

Internal.—*Alimentary canal.*—Excessive tea-drinking may cause indigestion, but this is probably induced by the tannin in the tea, and not by the caffeine. The teeth of tea-tasters are very liable to decay. Coffee is, with some persons, slightly laxative; it is not known to what ingredient this is due.

Circulation.—Caffeine is freely absorbed. It produces no change in the blood. Experiments concerning its action on the heart are contradictory, but there appears no doubt that in man moderate doses **increase** the **force** of the cardiac **contraction and the duration** of the **systole,** the diastolic period being shortened; as a consequence of this the blood-pressure rises. Toxic doses paralyze the heart. These effects are also produced by the local application of caffeine to the heart of the frog.

Respiration.—This is not much influenced by caffeine. Medicinal doses are said to excite and toxic doses to depress it.

Nervous system.—It is well known that tea and coffee **stimulate** the **cerebrum.** This is due to the caffeine in them. The patient becomes wakeful, the mental activity and capability for work are increased, the reasoning powers being quite as much affected as the imagination. In this respect the cerebral stimulation of caffeine differs from that of opium, and also in that the excitation is not inco-ordinate, nor is it soon replaced by sleep. Very excessive tea-drinking causes trembling of all the muscles of the body, and makes the patient extremely "nervous."

In man the spinal cord and muscles are very little affected by caffeine, but in some frogs the spinal cord is decidedly stimulated, and convulsions occur; in other species the muscles are thrown into a state of rigidity, which is clearly due to an action on the muscles themselves, for it follows the application of caffeine to an isolated muscle. Sometimes the muscle curve is altered in character. It is believed that in man the powers of

muscular endurance are increased by caffeine. Motor and sensory nerves are uninfluenced in all animals.

Kidneys.—By means of the oncometer it has been shown that the first effect of a dose of caffeine is to cause a contraction of the kidney with a decrease in the urinary flow; but soon the organ becomes larger than it was before the experiment, and the flow of urine is increased. Thus caffeine is a good **local diuretic.**

Metabolism.—Many elaborate experiments have been made upon the action of caffeine on tissue waste; they are all of them inconclusive, probably because it has no effect. Some say it decreases, some that it increases, the elimination of urea. Toxic doses may cause a slight rise of temperature.

Therapeutics.

Heart.—Caffeine has been most used in heart disease. It is given when, as in aortic or mitral obstruction, a purely stimulant effect is desired; large doses, 10 or 20 gr. [.60 to 1.20 gm.] a day of the [citrated, or 2 to 6 dr. [8. to 24. gm.] of the effervescent citrated], are often easily borne, and may be combined with strychnine. [These preparations are useful, when combined with antipyrin or acetanilid derivatives, to counteract their depressing influence upon the heart.] Caffeine will not replace digitalis, for it does not slow the heart nor make it regular, and it shortens the diastole. It is, on account of its diuretic action, especially valuable in cardiac cases in which there is dropsy. Tea and coffee are, in some persons, liable to produce irregularity of the heart.

Kidney.—Small doses of caffeine are powerfully diuretic, and are therefore used in heart disease, ascites, pleuritic effusion, etc. As the drug acts directly on the kidney, it should be given cautiously in renal disease. Many patients so soon become used to it that at the end of a week it has lost its power of producing diuresis.

Nervous system.—Occasionally it cures migraine, but it is not so useful as [antipyrin] or exalgin (*see* Appendix).

It may be rendered sufficiently soluble for subcutaneous administration by mixing it with a solution of sodium salicylate.

[GUARANA.

GUARANA. *Synonym.*—Brazilian Cocoa. A dried paste chiefly consisting of the crushed or pounded seeds of *Paullinia Cupana*, Kunth (*Paullinia sorbilis*, Martius; nat. ord. *Sapindaceæ*). *Habitat.*—Northern and Western Brazil.

CHARACTERS.—Subglobular or elliptic cakes, or cylindrical sticks, hard, dark reddi-h-brown; fracture uneven, somewhat glossy, pale reddish-brown, showing fragments of seeds invested with blackish-brown integuments; odor slight, peculiar, resembling that of chocolate; taste, astringent and bitter. *Solubility.*—It is partly soluble in water, and in Alcohol.

COMPOSITION.—The chief constituents are (1) *Guaranine*, identical with Caffeine, 4 to 5 per per cent. (*see* p. 331); (2) Volatile Oil, a trace; (3) Saponin; (4) Tannin.

Dose, ¼ to 1 dr.; 1 to 4 gm.

Preparation.

Extractum Guaranæ Fluidum.—Fluid Extract of Guarana. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

ACTION AND THERAPEUTICS.

Although there is no reason to believe that guaranine does not produce the same action on the nervous system, heart and kidneys as caffeine, yet it is rarely used except for sick headaches; but in these cases it is sometimes of the greatest service.]

CLASS II.

NUX VOMICA.

NUX VOMICA. *Synonyms.*—[Dog Button. Poison Nut. The seed of *Strychnos Nux-vomica* Linné (nat. ord. *Loganiaceæ*). *Habitat.*—India and East Indian Islands.]

CHARACTERS.—[About 25 mm. in diameter, orbicular, grayish or greenish-gray; soft-hairy, of a silky lustre, with a slight ridge extending from the centre of one side to the edge; internally horny, somewhat translucent, very tough, with a large, circular cavity, into which the heart-shaped, nerved cotyledons project. It is inodorous and persistently bitter.]

COMPOSITION.—The chief constituents are—(1) *Strychnine* (*q. v.*), 0.2 to

0.6 per cent.; (2) *Brucine*, $C_{23}H_{26}N_2O_4$, 0.5 to 1.0 per cent. in rectangular octahedra. Very bitter, but less so than Strychnine. *Solubility.*—Freely in Alcohol, and in 7 parts of Chloroform. It has the same action as Strychnine, but it is considerably less powerful and slower in its effects. Strong Sulphuric or Nitric Acid gives a blood-red color. (3) *Igasuric Acid*, with which the Strychnine and Brucine are united. (4) [*Loganin*, $C_{25}H_{34}O_{14}$ in colorless prisms.

Dose, 1 to 4 gr.; .06 to .24 gm.]

Preparations.

1. **Extractum Nucis Vomicæ.**—[Extract of Nux Vomica. By maceration with Acetic Acid, Alcohol and water, and percolation with Alcohol and water, and distillation; treat with Ether, filter, evaporate and add Sugar of Milk.

Extract of Nux Vomica is used to make Tinctura Nucis Vomicæ.

Dose, ⅛ to 1 gr.; .008 to .06 gm.

2. **Extractum Nucis Vomicæ Fluidum.**—Fluid Extract of Nux Vomica. By digestion with Acetic Acid, Alcohol and water, and percolation with Alcohol and water. Distil off the Alcohol and evaporate.

Dose, 1 to 4 m.; .05 to .24 c.c.

3. **Tinctura Nucis Vomicæ.**—Tincture of Nux Vomica. Extract of Nux Vomica, 20; Alcohol and water to 1000. By solution.

Dose, 5 to 20 m.; .30 to 1.20 c.c.]

STRYCHNINA.—Strychnine. $C_{21}H_{22}N_2O_2$ [=333.31. An alkaloid obtained from Nux Vomica, and also obtainable from other plants of the natural order *Loganiaceæ*.

SOURCE.—(1) Comminute the Nux Vomica; (2) Extract the Strychnine with water acidulated with Hydrochloric Acid; (3) Concentrate the infusion, decompose the Strychnine with Lime; (4) Extract the Strychnine from the precipitate with boiling Alcohol; (5) Concentrate the solution to obtain the crystals.

CHARACTERS.—Colorless, transparent, octahedral or prismatic crystals, or a white, crystalline powder, odorless, and having an intensely bitter taste perceptible even in highly dilute (1 in 700,000) solution. Permanent in the air. *Solubility.*—In 6700 parts of water, and in 110 parts of Alcohol; in 2500 parts of boiling water, and in 12 parts of boiling Alcohol. Also soluble in 7 parts of Chloroform, but almost insoluble in Ether.] Gives no color with Nitric or Sulphuric Acids. Add to a crystal, strong Sulphuric Acid, and then add a particle of Potassium Bichromate, a beautiful violet color, passing to

brown and green, is formed. Resembles Strychnine.—Salicylic Acid (see p. 468).

IMPURITY.—Brucine, distinguished by tests.

[*Strychnine is used to prepare* Ferri et Strychninæ Citras and Syrupus Ferri, Quininæ et Strychninæ Phosphatum.

Dose, $\frac{1}{15}$ to $\frac{1}{30}$ gr.; .002 to .003 gm., in solution, or made into a pill with Sugar of Milk (to thoroughly divide it) and Glycerin of Tragacanth; or hypodermatically. The Nitrate, soluble 1 in 60 of water, may be used.

STRYCHNINÆ S hnine Sulphate. $(C_{21}H_{22}N_2O_2)_2$ $H_2SO_4 + 5H_2O = 854.24$.

SOURCE.—By the act di uric Acid on Strychnine, filtration and evaporation.

CHARACTERS.—Colo tic crystals, odorless, and having an intensely bitter taste highly dilute (1 in 700,000) solution. Efflorescent in —In 50 parts of water, and in 109 parts of Alcohol; almost insolu er.

Dose, $\frac{1}{30}$ to $\frac{1}{12}$ gr.; .002 to .005 gm.

ACTION.

External.—Strychnine is a very powerful **antiseptic.** Brucine is a local anæsthetic.

Internal.—*Gastro-intestinal tract.*—Being intensely bitter, nux vomica is a good **stomachic,** increasing the vascularity of the gastric mucous membrane, the secretion of gastric juice, and the movements of the stomach, just like calumba, gentian, or any other bitter; consequently it aids digestion and sharpens the appetite. In the intestine it is a direct stimulant to the intestinal muscular coat, and by this means it **increases peristalsis,** and is therefore purgative.

Blood.—Strychnine is absorbed into the blood, and circulates as such. If blood is mixed with strychnine and shaken with air, it contains more oxygen and less carbon dioxide than it would have done had the strychnine been absent; but there is no evidence that strychnine in small doses alters the oxidizing power of living blood.

Spinal cord.—Strychnine causes **convulsions.** They are not cerebral, for they occur if the spinal cord is separated from the brain. They do not depend upon excitation of the motor

nerves or muscles, for they are absent in a limb the spinal anterior nerve-roots of which are cut. They do not depend upon stimulation of sensory nerves, for they occur even if the posterior nerve-roots are cut. Therefore they must be **spinal**; and this is proved by the fact that if all the vessels of the lower part of the spinal cord are [ligated] just at their entry into the cord, so that this is the only part of the body deprived of its blood supply, and strychnine is injected into the blood, convulsions occur in all the muscles except those the nerves of which spring from the part of the cord which the strychnine cannot reach. Again, if an animal be convulsed by strychnine, and a probe be slowly passed down the spinal canal, the convulsions will gradually cease from above downwards. Strychnine, therefore, enormously increases the excitability of the motor nerve-cells of the spinal-cord. The result is that even the slightest stimulus, as a breath of air, acting reflexly, causes violent convulsions.

Muscles and nerves.—Even with enormous doses the muscles and afferent nerves are unaffected. Towards the end of a case of poisoning the functional activity of the motor nerves is depressed. This is not due, as has been thought, to their exhaustion from the transmission of the impulses from the spinal cord which produce the convulsions, but it is the result of a direct paralyzing effect on the motor nerves themselves.

Brain.—The **convolutions** are quite **unaffected.** The centres in the medulla, which are really the continuation upwards of the anterior cornual cells of the cord, are **powerfully stimulated,** especially the **respiratory centre.** The **vaso-motor centre** is also considerably **excited,** and chiefly for this reason the blood-pressure rises from the very first. The cardiac centre is but slightly affected.

Circulation.—Strychnine **stimulates the heart directly,** either by its action on the cardiac muscles or, as most authorities think, by stimulating the motor ganglia. The **blood-pressure is raised,** partly no doubt by the action on the heart, but also by the contraction of the vessels all over the body, which is brought about first by the direct excitation by the strychnine, of

the medullary vaso-motor centre, and subsequently by its asphyxial stimulation, and also by the increased peripheral resistance which must occur from the frequent contraction of all the muscles.

Respiration.—Respiration is rendered **quicker and deeper** because strychnine excites the spinal and medullary respiratory centers. The respiratory muscles are implicated in the general convulsions, with the result that the patient ultimately becomes asphyxiated owing to exhaustion of them, and to their prolonged contraction during the convulsive spasms. The heart continues to beat after death, which is entirely due to failure of respiration. The temperature is a little raised during strychnine poisoning.

Special senses.—The hearing and sight are sharpened by strychnine.

Elimination.—Part of the strychnine is eliminated unchanged in the urine; the rest appears as strychnic acid. It is excreted very slowly, and therefore accumulates in the system. For a clinical account of strychnine poisoning *see* Toxicology.

Brucine and thebaine act like strychnine, but methyl-brucine, methyl-thebaine, and methyl-strychnine do not influence the cord, but paralyze the ends of the motor nerves like curare.

Strychnine acts on all animals as on man; but chickens, guinea-pigs, and perhaps monkeys are less susceptible to it than other animals.

THERAPEUTICS.

External.—Strychnine is so poisonous that its use as an antiseptic would not be safe.

Internal.—*Gastro-intestinal tract.*—Tincture of nux vomica is very largely given with excellent results as a bitter stomachic and carminative, especially in cases in which the feebleness of digestion is merely part of generally feeble health. A mixture of diluted hydrochloric acid, gentian and nux vomica is of great service in these cases. As the digestion improves the general health improves. Because of its power to stimulate peristalsis nux vomica is a valuable drug for cases of constipation in which the contractile strength of the muscular coat of the intestine is

weak; usually this is part of a general weakness of the whole body. The constipation of anæmia, which can be very successfully treated by a pill of extract of nux vomica and ferrous sulphate, is a good instance of this variety of constipation.

Circulation.—In cases of heart disease in which digitalis is inadmissible, nux vomica and strychnine are excellent cardiac stimulants, and for this purpose they may be combined with caffeine. Patients almost dead from failure of the heart in the course of chronic cardiac disease may sometimes be brought around by the subcutaneous injection of strychnine.

Respiration—Strychnine may be combined with expectorants, because it stimulates the respiratory centre; and it is extremely serviceable when from any cause, such as severe bronchitis, the respirations are feeble and shallow. [It is also useful in pnuemonia when death is imminent from dilatation of the right heart. In this condition it should be administered hypodermatically and at frequent intervals.]

Nervous system.—It has been given for a number of nervous diseases, but with no constantly good results, for when the disease is not in the anterior cornua, strychnine is hardly ind cated; and if it is in this part of the cord, it is doubtful whether it is advisable to stimulate the part of the body which is diseased.

Toxicology.

In about an hour after a poisonous dose the patient begins to feel uneasy from a sensation of impending suffocation. The tetanic convulsions then commence with great violence, nearly all the muscles of the body being affected at once. The limbs are thrown out, the hands are clenched, the head is jerked forwards and then bent backwards, and the whole body is perfectly stiff from the violence of the contractions. The pulse is very rapid; the temperature may rise. Hearing and sight are acute. The convulsion lasts a minute or two, then the muscles relax, and the patient feels exhausted and sweats all over. The intermission is short, convulsions soon come on again, and again there is a relapse to the state of muscular relaxation. The convulsions now rapidly increase in severity, and owing to the violent contractions of the muscles of the back, the patient is in the position of opisthotonos, resting on his head and his heels. The abdominal muscles are as hard as a board, the chest is fixed, the face becomes livid, the eyeballs are staring. The contraction of the muscles of the face causes a *risus sardonicus;* but those of the jaw are not affected till

near the end. Consciousness is retained till the last. The slightest noise or even a bright light will reflexly bring on the convulsions, which may jerk the patient out of bed. Ultimately he dies from exhaustion and asphyxia. The smallest dose of strychnine known to have killed is half a grain; .03 gm. *Post-mortem.*—The usual appearances of death by asphyxia are seen.

Strychnine poisoning is liable to be confounded with *tetanus*, but in this disease symptoms come on more slowly, the muscles of the jaw are implicated very early, and there is continuous muscular rigidity with paroxysmal exacerbations, but never complete muscular relaxation.

Treatment.—Give emetics (*see* p. 83), or wash out the stomach if the case is seen early enough for the passing of the tube not to cause spasm. Also give plenty of animal charcoal or tannic acid, but continue the washing out. Inject large doses of potassium bromide and chloral *per rectum*. Use amyl nitrite inhalations, and if possible artificial respiration.

ANTAGONISM.

In a sense strychnine is antidotal to chloral and morphine, but it is not a strict antidote, for they act chiefly on the cerebrum. Still chloral is valuable in strychnine poisoning, and although the antagonism with Calabar bean and gelsemium is more accurate, as both depress the anterior cornua, yet they are of very little use in strychnine poisoning.

PHYSOSTIGMA.

PHYSOSTIGMA. [*Synonym.*—Calabar bean. The seed of *Physostigma venenosum* Balfour (nat. ord. *Leguminosæ*). *Habitat.*—Tropical Western Africa, near the mouth of the Niger and old Calabar.

CHARACTERS.—About 25 to 30 mm. long, 15 to 20 mm. broad, and 10 to 15 mm. thick; oblong, and somewhat reniform; testa granular, chocolate-brown, with a broad, black groove extending over the entire length of the convex edge; embryo with a short, curved radicle, and two large, white, concavo-convex cotyledons; inodorous; taste, bean-like.

COMPOSITION.—The chief constituents are: (1) *Physostigmine* or *eserine* (*see* below); (2) *Calabarine*, derivative of *physostigmine*; (3) *Eseridine*; and (4) *Physosterin*, a neutral principle closely related to cholesterine.]

Dose, ½ to 2 gr.; .03 to .12 gm. of powdered beans.

Preparations.

1. **Extractum Physostigmatis.**—[Extract of Physostigma. By maceration, percolation with Alcohol and evaporation.]

Dose, $\frac{1}{10}$ **to ½ gr.;** [.006 to .03 gm.] internally, or rather less dissolved in 10 m. [.60 c.c.] of water and given subcutaneously.

2. **Tinctura Physostigmatis.**—Tincture of Physostigma. Physostigma, 150. By maceration, percolation with alcohol to 1000.

Dose, 10 to 30 m.; [.60 to 2.00 c.c.]

[**PHYSOSTIGMINÆ SALICYLAS.**—Physostigmine Salicylate. $C_{15}H_{21}N_3O_2C_7H_6O_3 = 412.17$. *Synonym.*—Eserine Salicylate. The Salicylate of an alkaloid obtained from Physostigma.

SOURCE.—By adding Physostigmine to a solution of Salicylic Acid in boiling distilled water, and allowing the salt to crystallize on cooling.

CHARACTERS.—Colorless or faintly yellowish, shining, acicular, or short, columnar crystals, odorless, and having a bitter taste. It acquires a reddish tint when long exposed to light and air. *Solubility.*—In 150 parts of water, and in 12 parts of Alcohol.

Dose, $\frac{1}{100}$ **to** $\frac{1}{30}$ **gr.; .0006 to .002 gm.**

PHYSOSTIGMINÆ SULPHAS.—Physostigmine Sulphate. $(C_{15}H_{21}N_3O_2)_2H_2SO_4 = 646.82$. *Synonym.*—Eserine Sulphate. The Sulphate of an Alkaloid obtained from Physostigma.

CHARACTERS.—A white or yellowish-white, micro-crystalline powder; odorless, and having a bitter taste. It is very deliquescent when exposed to moist air, and gradually turns reddish by exposure to air and light. *Solubility.*—Very soluble in water and in Alcohol.

Dose, $\frac{1}{100}$ **to** $\frac{1}{30}$ **gr.; .0006 to .002 gm.**]

ACTION.

External.—None.

Internal.—*Mouth.*—After physostigmine is absorbed it **increases the salivary secretion**; and this, according to some, is through its action on the centre in the medulla; according to others, by its direct effect on the salivary cells. After a time the flow of saliva ceases, because the drug has so acted on the circulation as to constrict the vessels, and consequently the flow of blood through the salivary glands is diminished.

Stomach and intestines.—The **muscular coat** of the stomach and intestines is **stimulated** by the direct action of the drug circulating through it. The result is that after a large dose vomiting and purging occur. Physostigmine is quickly absorbed.

Circulation.—No influence on the blood is known. The effect on the heart is obscure, but it appears that the irritability of the peripheral terminations of the vagus is at first increased, and that consequently the heart is **slowed.** Very large doses are said to decrease the irritability of the vagus. In addition to

its effects on the vagus, physostigmine powerfully stimulates the contractile force of the heart. The **beat** is therefore both more **forcible** and slower. Ultimately the organ is paralyzed and stops in diastole.

The **blood-pressure rises** very much; this is largely due to the increased force of the cardiac beat, but perhaps partly to the irritation of the muscular coat of the arteries by physostigmine, for it **stimulates most of the involuntary muscles** in the body.

Respiration is first quickened, but soon retarded, and **death** takes place from **asphyxia.** Three factors at least are probably concerned in bringing about these results. The ends of the vagi in the lungs are stimulated, for if these nerves are cut and physostigmine is administered there is no primary quickening of respiration. Physostigmine, from its action on involuntary muscular fibre, causes contraction of that in the bronchial tubes, with consequent constriction of them. Lastly and the most important, the activity of the respiratory centres in the medulla and cord is depressed.

Nervous system.—Brain.—Even in fatal doses consciousness is unimpaired. The only part of the brain known to be affected is the respiratory centre.

Spinal cord.—It is here that physostigmine produces its most characteristic effects. **Reflex activity is inhibited**; by exclusion it can be shown that this is not owing to any influence on the nerves or voluntary muscles, therefore it is due to depression of the **anterior cornua** of the spinal cord. The most conclusive proof of this is the direct application of the drug to the cord. There is then, at first, from the irritation, which is caused by almost any substance, a slight increase of reflex excitability, but this soon gives way to complete abolition of it. Later on the posterior part of the cord is also paralyzed, so that there is a diminution of cutaneous sensibility.

Voluntary muscles and their nerves.—These are but slightly influenced. With very large doses the irritability of motor nerves and muscles is slightly depressed; sensory nerves are unaffected.

Involuntary muscles.—We have already seen that the involuntary muscles of the intestines, stomach, and bronchial tubes are stimulated by physostigmine; so also are those of the spleen, uterus, bladder, and iris. It is not decided whether in all these instances it is the muscular fibres or the terminations of the nerves in them that are affected.

Eye.—Physostigmine applied locally to the conjunctiva or introduced into the circulation causes **contraction of the pupil, spasm of accommodation,** and a **diminution of intra-ocular tension.** In the main these effects are due to **irritation** of the terminations of **the third nerve,** and can be prevented by atropine. Some consider that the muscular fibres are also affected, and others that the peripheral sympathetic nerve-fibres in the iris are paralyzed.

Secretions.—The saliva, sweat, tears, and buccal mucus are increased. The cause of this is unknown.

The action of physostigmine is much more constant than that of Calabar bean, because the calabarine (which stimulates the cord) in the bean interferes with the action of physostigmine.

Therapeutics.

Involuntary muscles.—Because of its stimulating power on unstriped muscle Calabar bean has been recommended for chronic constipation, atony of the bladder, and chronic bronchitis with deficient power of expectoration, but it is rarely given for these purposes.

Spinal cord.—Calabar bean has been largely used for tetanus, and some cases of recovery have been reported; probably it is the most efficacious drug we have for this disease. It must be administered boldly, ⅓ gr. [.02 gm.] of the extract frequently repeated may be injected under the skin; or if physostigmine itself is preferred, the salicylate may be given subcutaneously in doses of $\frac{1}{60}$ to $\frac{1}{12}$ gr., [.001 to .005 gm.] or 1 to 6 m. [; .06 to .30 c.c.] of a solution of physostigmine salicylate in water [1 in 160]. The sulphate may be used in the same doses. Physostigmine has been given as an antidote for strychnine poisoning.

Eye.—A solution of physostigmine salicylate is dropped in the eye to break up adhesions of the iris, to diminish intra-ocular tension, and to prevent prolapse of the iris after wounds or ulcers of the cornea. It is also employed in glaucoma, in paralysis of the iris and ciliary muscles, and to prevent the entrance of light into the eye in photophobia. If used in solution, physostigmine salicylate, 1 to 2, to water, 480, is the usual strength.

It will be observe… …ie pupil, on secretion, on the heart, and on respirat… …gonistic to Atropine. In its action on the spinal co… …it is antagonistic to Strychnine.

GELSEMIUM. … Jasmine. The rhizome and roots of *Gelsemium sem…* …soon (nat. ord. *Loganiaceæ*).

Habitat.—Southern U…

CHARACTERS.—Cylin… …sections, mostly from 5 to 15 mm. and occasionally 3 cm. thick, the … …uch thinner; externally light yellowish-brown, with purplish-brown, longitudinal lines; tough; fracture splintery; bark thin, with silky bast-fibres, closely adhering to the pale yellowish, porous wood, which has fine, medullary rays, and in the rhizome a thin pith; odor, aromatic, heavy; taste bitter.]

COMPOSITION.—The chief constituents are—(1) *Gelsemine*, $C_{54}H_{60}N_4O_{12}$, a colorless, with difficulty crystallizable, bitter alkaloid, soluble in Alcohol and Ether, sparingly in water. (2) [*Gelseminine*, a brown, amorphous, bitter alkaloid. (3) *Gelseminic Acid.* (4) A volatile oil.

Dose, 5 to 10 gr.; .30 to .60 gm. Of Gelsemine, $\frac{1}{60}$ to $\frac{1}{20}$ gr.; .001 to .003 gm.

Preparations.

1. Extractum Gelsemii Fluidum.—Fluid Extract of Gelsemium. By maceration and percolation with Alcohol and evaporation.

Dose, 5 to 10 m.; .30 to .60 c.c.

2. Tinctura Gelsemii.—Tincture of Gelsemium. Gelsemium, 150; by maceration and percolation with Alcohol, to 1000.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c]

ACTION.

External.—None.

Internal.—Gelsemium produces no effect on the stomach or intestines.

Brain.—In poisoning by Gelsemium consciousness is maintained till the end; the drug, therefore, has no power on the higher cerebral centers.

Spinal cord.—The most marked symptom produced by gelsemium is **paralysis of all the muscles** of the body; and by a series of experiments, like those used for strychnine, this can be shown to be due to **depression of the activity of the anterior cornua** of the spinal cord. This is said to be followed by a depression of the sensory part of the cord, with consequent anæsthesia. The motor nerves and muscles are quite unaffected, even till death. The result of this action on the cord is that the patient may be unable to walk, or if he can, the gait is staggering; his general sensibility is much impaired. Convulsions may be produced. The cause of these cannot be made out, for they appear to be neither cerebral, spinal, nor peripheral.

Eye.—Gelsemium soon causes disturbance of vision, then follows **diplopia,** due to **paralysis** of the **ocular muscles,** and from the same cause the upper lid drops. The **pupil is dilated.** All these symptoms are probably owing to the paralysis of the motor cells in the floor of the fourth ventricle and the aqueduct of Sylvius, for these are the continuation upwards of the anterior cornual cells.

Circulation.—The action of moderate doses is not marked. Toxic doses are powerfully depressant; the force and rate of the pulse and the blood-pressure fall. This is owing to a direct action on the heart. How far these effects are due also to affection of the medullary and spinal centres is not known.

Respiration.—Soon after the administration of gelsemium the respiration becomes slower and more feeble; ultimately it stops, death taking place by **asphyxia.** This is due to paralysis of the respiratory centres in the cord and medulla. Before death the temperature falls, and the skin is bathed in a cold sweat.

Therapeutics.

Gelsemium was formerly given as a circulatory depressant, but it is not now used, as its other effects are so harmful. Nor

is it any longer prescribed for convulsive diseases, as tetanus, whooping-cough, chorea, etc., as it was not found to do any good. It is occasionally used for neuralgia and migraine; how it acts is quite uncertain; the dose must be pushed, and often the drug fails. Sometimes it is employed to dilate the pupil and paralyze accommodation. It will do this when applied locally, for it is quickly absorbed from the eye. It has the advantage that its influence passes off rapidly. Discs [of gelatin], each containing $\frac{1}{500}$ gr. [.00013 gm.] gelsemine, are made for application to the eye.

CLASS III.

CONIUM.

CONIUM.—[*Synonym.*—Hemlock. The full grown fruit of *Conium Maculatum*, Linné (nat. ord. *Umbelliferæ*), gathered while yet green. *Habitat.*—Europe and Asia; naturalized in North America.

CHARACTERS.—About 3 mm. long; broadly ovate, laterally compressed; grayish-green; often divided into the two mericarps, each with five crenate ribs, without oil-tubes, and containing a seed which is grooved on the face; odor and taste slight.] *Resembling conium fruit.*—Caraway, anise, dill, all known by having vittæ [(oil-tubes)].

COMPOSITION.—The chief constituents are—(1) *Coniine*, $C_8H_{17}N$, the active principle; [a colorless, oily, volatile alkaloid, of a disagreeable odor and acrid taste]. *Solubility.*—In 100 parts of water. It is easily obtained from the plant by distillation with alkalies. It is readily decomposed by light and heat, and the preparations of Conium are therefore of very varying strengths. Its salts are much more stable. (2) *Methyl-coniine*, $C_8H_{19}CN$. A colorless, liquid alkaloid. (3) *Conhydrine*, a nearly inert crystallizable alkaloid.

INCOMPATIBLES.—Caustic alkalies, vegetable acids, and astringents.

Dose, 2 to 5 gr.; [.12 to .30 gm.]

Preparations.

[**Extractum Conii.**—Extract of Conium. By maceration and percolation with diluted Alcohol and Acetic Acid, and evaporation.

Dose, ½ to 1 gr.; .02 to .06 gm.

2. **Extractum Conii Fluidum.**—Fluid Extract of Conium. By maceration and percolation with diluted Alcohol and Acetic Acid, and evaporation.

Dose, 2 to 5 m.; .12 to .30 c.c.]

Action.

External.—Coniine has no influence on the unbroken skin, but it has been thought to be anæsthetic when applied to painful broken surfaces. This is doubtful, for, in the first place, we have no proof that it can be absorbed from sores; and, secondly, experiments show that enormous doses have to be given to depress the activity of sensory nerves.

Internal.—*Gastro-intestinal tract.*—It has no special action here, but it may occasionally give rise to vomiting and diarrhœa.

Circulation.—Coniine is absorbed into the blood, and circulates unchanged. As it paralyzes the terminations of the vagus it probably increases the rapidity of the cardiac beat, but this subject has not yet been satisfactorily worked out.

Nervous system.—Nerves.—It is on these that coniine and methyl-coniine, the active principles of conium, chiefly act. Coniine is much the more energetic. It powerfully **depresses** the functional activity of **all the motor nerves** in the body. This depression begins at their periphery, and gradually **ascends** till the whole nerve, from the periphery to the spinal cord, is incapable of responding to stimuli. This leads to paralysis of all the muscles of the body as far as voluntary and reflex motion is concerned, but they themselves are unaffected, retaining their irritability to local stimuli. The sensory nerves are not implicated unless the dose is very large; then their conducting power is slightly impaired.

Spinal cord.—This remains uninfluenced till quite late; then, if poisonous doses have been given, the function of its motor cells is feebly depressed, as is also that of the respiratory centre in the medulla. As methyl-coniine inhibits the reflex activity of the spinal cord earlier than coniine, the exact period at which this effect comes on varies with different preparations.

Brain.—Except for the respiratory centre the whole of the brain is unaffected by coniine. Consciousness is preserved until the stage of asphyxia.

Eye.—Coniine, when dropped into the eye, causes immediate contraction of the pupil reflexly from the conjunctival irritation.

motor nerves, and the later depressi
and motor part of the cord, death tak
of respiration and consequent **asphy**

Coniine is excreted unchanged, ch

THERAPEUTIC

External.—Conium has been app
sores, but it is, for the reasons already
produces any good effect. It has also b
and rheumatism, but it is quite useless.

Internal.—Conium is rarely given
amount of coniine extracted by any pre
(*b*) the amount of methyl-coniine preser
(*c*) coniine is very volatile; (*d*) it is uns
it inert. For these reasons it is probabl
copœial preparations contain no coniin
succus [B. P., which is the expressed juic
branches, to which 25 per cent. of alcoh
which is believed to be the most reliab
quently been swallowed without prod
preparations of the fruit are said by so
than those of the leaves. Conium has
diseases, as whoo

from paralysis of accommodation; the eyes are fixed, the pupil is dilated. Swallowing becomes difficult. Respiration is labored, the voice is lost, and death takes place from asphyxia. *Post-mortem.*—The organs are found congested with venous blood.

Treatment.—Emetics (*see* p. 83), and wash out the stomach. Give Tannic Acid and again wash it out. Stimulants subcutaneously, warmth to the feet, and artificial respiration [are necessary].

TABACUM.

TABACUM.—[Tobacco. The commercial, dried leaves of *Nicotiana Tabacum* (nat. ord. *Solanaceæ*). *Habitat.*—Tropical America; cultivated.

CHARACTERS.—Up to 50 cm. long, oval or ovate-lanceolate, acute, entire, brown, friable, glandular-hairy, of a heavy, peculiar odor, and a nauseous, bitter, and acrid taste.]

COMPOSITION.—The chief constituent is—*Nicotine*, [$C_{10}H_{14}N_2$ (0.7 to 5, sometimes 11 per cent.)]. A colorless, volatile, oily alkaloid, smelling and tasting like Tobacco leaves, darkening with age. *Solubility.*—Soluble in water, more so in Alcohol and Ether. Turkish Tobacco contains hardly any.

Nicotine is decomposed by heat, consequently Tobacco smoke contains none, but consists of small quantities of various Pyridine compounds, as Pyridine C_5H_5N, Picoline C_6H_7N, Lutidine C_7H_9N, Collidine $C_8H_{11}N$, [Parvoline $C_9H_{13}N$, Coridine $C_{10}H_{15}N$, Rubidine $C_{11}H_{17}N$,] and small amounts of Hydrocyanic and Acetic Acids, Creosote, Sulphur, and Carbon compounds.

ACTION.

Tobacco leaves, when taken internally, act entirely by virtue of their nicotine, which is one of the **most powerful and rapid poisons** known.

External.—Nicotine is an antiseptic.

Internal.—*Gastro-intestinal tract.*—Nicotine in even minute doses (¼ gr.; .009 gm.) promptly produces symptoms of **intense gastro-intestinal irritation.** They are greatly increased salivary flow, burning pain in the mouth, œsophagus and stomach, horrible nausea, quickly succeeded by vomiting and free purging. The marked characteristic of this gastro-intestinal irritation is the **extreme collapse** which accompanies it. Thus there is a rapid, very feeble pulse, intense muscular weakness, laborious respiration, partial loss of consciousness, occasional convulsions, icy extremities, and profound general collapse. A dose of nicotine has been known to kill in three minutes.

we are ignorant as to whether this is entirel
nicotine on the heart.

Respiration.—This is **paralyzed,** how,
is partly due to asphyxia.

Nervous system.—The cerebrum is probal
by nicotine. The convulsions occasionally
always in the frog, are due to spinal stimul
are agreed that ultimately the **function of**
is entirely abolished. This explains t
weakness. Probably the sensory nerves, an
cles, escape.

Eye.—A toxic dose taken internally, or t
of nicotine to the eye, **contracts** the **pup**
in excised eyes, and is therefore a local effec
due both to paralysis [of the] sympathetic a
third nerve.

Elimination.—Nicotine is probably elimi
the secretion of which it increases.

Therapeutics.

Tobacco is never used therapeutically.
ployed in the form of an enema of leave
spasm, so as to facilitate the reduction of

of the bowels. With many people it has an obscure effect, especially among those who lead sedentary lives, in stimulating the brain and producing a peaceable, calm state of mind. Over-indulgence in it may lead to loss of appetite and atrophy of the optic nerve.

[SCUTELLARIA.

SCUTELLARIA.—*Synonym.*—Skullcap. The herb of *Scutellaria lateriflora* Linné (nat. ord. *Labiatæ*). *Habitat.*—North America; west to Alabama, New Mexico and Oregon, in damp thickets.

CHARACTERS.—About 50 cm. long, smooth; stem quadrangular, branched; leaves opposite, petiolate, about 5 cm. long, ovate-lanceolate or ovate-oblong, serrate; flowers in axillary, one-sided racemes, with a pale blue corolla, and bilabiate calyx, closed in fruit, the upper lip helmet-shaped; odor slight; taste bitterish.

COMPOSITION.—(1) A bitterish principle. (2) Volatile oil, a trace.

Dose, 1 to 2 dr.; 4. to 8. gm.

Preparation.

Extractum Scutellariæ Fluidum.—Fluid Extract of Scutellaria. By maceration and percolation with diluted Alcohol and evaporation.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

USES.

Scutellaria has little medicinal effect. It is used as a nervous sedative; formerly it was given in decoction for epilepsy.]

COCA.

COCA.—[*Synonyms.*—Erythroxylon. Cuca. The leaves of *Erythroxylon Coca*, Lamarck (nat. ord. *Lineæ*). *Habitat.*—Peru and Bolivia; cultivated.

CHARACTERS.—Varying between ovate, lanceolate, and obovate-oblong, and from 2 to 5 or 7 cm. in length; short-petiolate, entire, rather obtuse or emarginate at the apex, slightly reticulate on both sides, with a prominent midrib, and on each side of it a curved line running from base to apex; odor slight and tea-like; taste somewhat aromatic and bitter. When chewed, it temporarily benumbs the lips and tongue.]

COMPOSITION.—It contains three alkaloids, viz., (1) *Cocaine*, 0.2 per cent.; (2) *Ecgonine*, $C_9H_{16}NO_3$, the methyl-benzoyl compound being cocaine. (3) *Hygrine*, a volatile liquid alkaloid. Also (4) Coca-tannin and (5) Coca-wax. Different specimens vary very much in strength of Cocaine. Fresh specimens are stronger than those that have been kept.

Dose, 1 to 4 dr.; [4. to 15. gm.] of the leaves infused in hot water.

Coca.]

SOURCE.—Agitate with Ether an aqueous solution o
holic extract, make alkaline with Sodium Carbonate; s
the Ethereal liquid; purify by repetition; decolorize, n
chloric Acid, and recrystallize.

CHARACTERS.—Colorless, [transparent crystals, o
powder, without odor; of a saline, slightly bitter taste,
the tongue a tingling sensation followed by numbness o
tion. Permanent in the air. *Solubility.*—In 0.48 part
parts of Alcohol; also soluble in 2800 parts of Ether, o
roform.

Dose, ⅛ to 2 gr.; .008 to .12 gm.]

ACTION.

External.—Cocaine has no action on th
but if injected subcutaneously or applied to m
—as, for example, those of the eye, nose, mou
—it produces **complete local anæsthes**
operations can be performed without the pat
A 5 to 10 per cent. solution of the hydro
enough to thus paralyze the sensory nerves.
must be applied to motor nerves to paralyze t

Internal.—*Gastro intestinal tract.*—Whe
internally, the gastric mucous membrane ex
thetic influence. Therefore the sensation of h
and persons taking cocaine can go a long ti

therefore the pulse quickens; larger doses slow it from stimulation of the vagus.

Respiration.—It acts upon the respiratory centre, first stimulating it, so that the rapidity and depth of respiration are increased; but soon depression of the centre follows, the respiratory movements become feeble, and death takes place from **asphyxia.**

Nervous system.—Cerebrum.—Moderate doses greatly **increase the bodily and mental power,** and give a sense of calm and happiness. This greater physical energy renders possible the performance of long, exhausting muscular feats. For this, and for the extreme sense of peace produced, coca leaves mixed with clay or ashes are chewed by thousands of the inhabitants of Peru and the neighboring countries. It is said that forty million pounds of the leaves are annually harvested. An excessive indulgence in the habit of coca-chewing leads to indigestion, extreme emaciation, insomnia and enfeeblement of intellect. In animals coca causes cerebral convulsions.

Spinal cord.—The effect of cocaine on this is obscure. Large doses are depressant. The action on nerves has been already mentioned. As a rule, muscles are unaffected.

Eye.—When a solution of cocaine is dropped into the eye there is first a transitory contraction of the pupil. This is probably due to reflex action, and soon gives way to **wide dilatation.** The maximum is attained in an hour or two. The normal state is regained in from twelve to twenty-four hours. The dilated pupil is feebly responsive to light, and the dilatation is rapidly overcome by physostigmine. The ocular tension is slightly lowered. Accommodation is partially, but never completely paralyzed. These effects are **due to irritation of the sympathetic,** and as they are quickly produced by dropping the drug in the eye they are probably **local.**

Temperature.—This may rise in cocaine poisoning.

Kidneys.—Cocaine is most likely excreted by these organs. Its influence on the quality and composition of the urine is not known.

throat, teeth, vagina, urethra and rec
applied to any of these parts when they ar
will relieve vaginal pruritus, and has be
in the nose in hay fever. Painful ulcers,
ficially treated with it. Ophthalmic su
largely to produce local anæsthesia of th
tions.

Internal.—*Mouth.*—A solution is use
ing on the throat previous to laryngeal ex
of the hydrochlorate, containing 1-12 gr
are valuable for painful sore throat.

Stomach.—Cocaine in some cases all
and has been said to cure sea-sickness.

It is not often used in Europe as a me
effects; as already mentioned, it is not a
does is only temporary.

[TOXICOLOGY.

The number of cases of poisoning is very
amounts have been recovered from, smaller dos
anxiety even when locally applied. The sympton
unconsciousness, failure of circulation, slow respi
more than ¾ gr.; .045 gm., should be applied at
face. Cocaine *habitués* are by no means infrequ
degradation is fully equal to that of opium eaters.

Treatment.—Should consist in stimulation, a
the drug has been ingested. Potassium permang

lar, longitudinally striate, more or less warty, usually hollow in the center, cut into short sections. The thin bark is externally pale greenish, or light greenish brown, marked with alternate leaf-scars, and internally green; the greenish or yellowish wood forms one or two concentric rings. Odor slight; taste bitter, afterwards sweet.

COMPOSITION.—(1) *Solanine*, $C_{42}H_{87}NO_{15}$, the active alkaloid. (2) *Dulcamarin*, $C_{22}H_{34}O_{10}$, 0.4 per cent. a glucoside, soluble in water and Alcohol, and yielding frothy solutions. (3) Resin. (4) Gum.

Dose, 1 to 2 dr.; 4. to 8. gm.

Preparation.

Extractum Dulcamaræ Fluidum.—Fluid Extract of Dulcamara. By maceration and percolation with diluted Alcohol and evaporation.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

ACTION AND USES.

Dulcamara possesses feeble narcotic, analgesic and mydriatic properties. It increases the secretions, particularly those of the kidneys and skin, with some diminution of sensibility. In large doses it is an acro-narcotic poison. It has been employed chiefly for cutaneous eruptions, particularly of a scaly character, and it might be useful in neuralgia.]

[PILOCARPUS.

PILOCARPUS.—*Synonym.*—Jaborandi. The leaflets of *Pilocarpus Selloanus* Engler (Rio Janeiro Jaborandi), and of *Pilocarpus Jaborandi*, Holmes (Pernambuco Jaborandi), (nat. ord. *Rutaceæ*). *Habitat*,—Brazil, near Pernambuco.]

CHARACTERS.—[About 10 to 15 cm. long, and 4 to 6 cm. broad, short-stalked, oval or ovate-oblong, entire and slightly revolute at the margin, obtuse and emarginate, unequal at the base; dull green, coriaceous, pellucid-punctate, mostly smooth; when bruised, slightly aromatic; taste somewhat bitter and pungent.]

IMPURITIES.—Leaves of species of *Piper*, not oval-oblong.

COMPOSITION.—The chief constituents are—(1) A liquid, colorless, alkaloid, *Pilocarpine* $C_{11}H_{16}N_2O_2$, ¼ to ½ per cent. (2) *Jaborine* [$C_{22}H_{32}N_4O_4$], an alkaloid resembling in its physiological action Atropine, and therefore antagonistic to Pilocarpine. (3) [*Pilocarpidine*, $C_{10}H_{14}N_2O_2$, a decomposition product whose action is weaker than Pilocarpine.] (4) A volatile oil [chiefly *Pilocarpene*, $C_{10}H_{16}$]. (5) A peculiar acid. These active principles are soluble in Alcohol, but only imperfectly so in water.

Dose, 5 to 60 dr.; [.30 to 4.00 gm.]

from Pilocarpus.

SOURCE.—Obtained by exhausting Pi
with Hydrochloric Acid, distillation and ev
with a slight excess of Ammonia, and a lar
solution is agitated with water, to which Hy
tralize. The Hydrochlorate is obtained on
purified by re-crystallization.

CHARACTERS.—Small, white crystals, od
taste; deliquescent on exposure to damp a
water and in Alcohol; almost insoluble in Et

Dose, ⅛ to ⅓ gr.; .008 to .02 gm.]

ACTION.

External.—None.

Internal. — *Gastro-intestinal tr*
quickly absorbed, and soon produces a
amount of salivary secretion.
and there may be a feeling of tend
glands. The saliva contains an abun
and can convert starch into sugar. Its
stimulation of the filaments of the c
nerves which end in the cells of th
stimulation of these nerves can add
duced by the drug —in fact, not more
by vascular alterations. This action is
by belladonna, as that paralyzes the er

a **cardiac depressant.** The pulse-rate, it is true, may be, and in the human being always is, a little accelerated at first, but soon both it and the blood-pressure fall. This slowing of the pulse is at once set aside by atropine, but is not prevented by section of the vagus, therefore pilocarpine acts on the heart itself, probably stimulating the terminations of the vagus. The blood-vessels are at first dilated.

Respiration.—The drug has no effect on this. The amount of bronchial secretion is increased.

Skin.—[Pilocarpus], through its alkaloid pilocarpine, produces a very **profuse** secretion of **sweat.** It is the most powerful diaphoretic drug we have. A single dose may cause the flow of fifteen fluid ounces [450 c.c.] of sweat. It is said that the proportion of urea and chlorides in the sweat is greatly increased. This profuse diaphoresis is due to the action of the pilocarpine on the cells of the sweat-glands, or the terminations of the nerves in them, and is stopped by atropine. The skin may flush, but this is not the cause of the diaphoresis. Under a course of [pilocarpus] the hair grows more actively, but it becomes very coarse and dark.

Kidneys.—If the sweating is profuse, the secretion of urine is lessened, but repeated small doses of pilocarpine lead to slight diuresis. It is excreted unchanged in the urine.

Temperature.—There may be a slight rise at first, but soon the temperature falls considerably. This is probably due in large part to the evaporation of the perspiration.

Eye.—Whether applied locally to the eye or given internally, pilocarpine produces **great contraction of the pupil,** due to stimulation of the ends of the third nerve in the eye, and this is antagonized by atropine. It also causes increased tension of the eyeball, and an approximation of the near and far points of distinct vision.

Other actions.—It stimulates the uterus, and has in very rare cases produced abortion. It increases the secretion of milk, of tears, of nasal mucus, and, according to some authors, that of cerumen. It causes the spleen and bladder to contract.

every case whether the cells of the g
tions in them are affected. (2) It s
tions of involuntary muscles—viz., i
stomach, the uterus, the spleen, the h
on the muscular coat of the vessels,
are usually dilated. The most impo
resis, the salivation, and the myosis.
nistic in its action to belladonna. C
it well. Pilocarpine is much more us
more prompt and more certain in its
cause indigestion.

Jaborine has an action similar to th
of it in [pilocarpus] varies, hence the
specimens of the leaves, but there is ne
teract the pilocarpine.

THERAPEUTI

Pilocarpine has been employed fo
great use is as a diaphoretic in Bright's
⅙ of a gr., [.01 gm.] or more of the
subcutaneously in the evening. The
ping the patient, who should be naked
and putting a hot-water bottle to his
has ceased, he should be dried and lef
is such a powerful cardiac depressant,

GROUP II.

Vegetable Drugs, whose main Action is on the Heart.

CLASS I.—The digitalis group, decreasing the frequency and increasing the force of the beat of the heart:

Digitalis, Strophanthus, Convallaria, Squill, Sparteine Sulphate.

CLASS II.—The Aconite group, decreasing the frequency and force of the beat of the heart:

Aconite, Veratrum Viride, Veratrina.

CLASS I.

DIGITALIS.

DIGITALIS.—[*Synonym.*—Foxglove. The leaves of *Digitalis Purpurea* Linné (nat. ord. *Scrophularineæ*), collected from plants of the second year's growth. *Habitat.*—Europe, in sandy soil and the edges of woods.

CHARACTERS.—From 10 to 30 cm. long, ovate or ovate-oblong, narrowed into a petiole; crenate; dull green, densely and finely pubescent; wrinkled above; paler and reticulated beneath; midrib near the base road; odor slight; somewhat tea-like; taste bitter nauseous.] *Resembling Digitalis leaves.*—Matico leaves, which are more deeply reticulated.

COMPOSITION.—The chief constituents are—(1) *Digitoxin*, a glucoside, crystallizable, the most active principle, very poisonous, cumulative. Insoluble in water, sparingly in Ether, soluble in Alcohol or Chloroform. (2) *Digitalin*, a crystalline glucoside sparingly soluble in water and Ether. (3) *Digitalein*, an amorphous glucoside, soluble in water, and therefore suitable for hypodermatic injections; dose hypodermatically $\frac{1}{100}$ gr.; .0006 gm., said to be non-cumulative. These three glucosides are said to represent the cardiac stimulating action of the drug. (4) *Digitonin*, [$C_{27}H_{44}O_{18}$] a glucoside closely allied both chemically and physiologically to, and perhaps identical with, the Saponin of Senega (*see* p. 381). Dose, $\frac{1}{300}$ to $\frac{1}{100}$ gr.; .0002 to .0006 gm. This is a cardiac depressant, and is therefore antagonistic to the other three glucosides. (5) Digitin, a substance devoid of physiological action. All these five bodies are non-nitrogenous. (6) Two acids, Digitalic and Antirrhinic. (7) Other usual constituents of plants, as tannin, volatile oil, coloring matter, starch, sugar, gum, salts. It will be noticed that Digitalis contains no Alkaloids.

The two following substances are met with in commerce: (**A**) Homolle's Digitalin (same as Quévenne's Digitalin), an amorphous whitish powder or small scales, intensely bitter, inodorous, but irritating to the nostrils. Soluble in 2000 parts of water. Consists chiefly of Digitalin with a little Digitoxin.

1. **Extractum Digitalis.**—[
and percolation with Alcohol an
and evaporation.

Dose, ¼ to 1 gr. ; .015 to .

2. **Extractum Digitalis Flu**
By maceration and percolation wit
tion.

Dose, ½ to 3 m. ; .03 to .2c

3. **Infusum Digitalis.**—Infu
Cinnamon Water, 150; boiling wat
to 1000.

Dose, 1 to 4 fl. dr.], (note tha
15. c. c.]

4. **Tinctura Digitalis.**—[Tin
diluted Alcohol to 1000. By macer

Dose, 5 to 30 m. ; .30 to 2.0

As the proportion of the many consti
some prefer always to give the powdered le
tonin and not much Digitoxin, the tincture
toxin.

ACTION

External.—The leaves are sligl
ful whether any of their constitue
skin.

of the heart, the **diastole is prolonged,** the duration of the systole is not altered, but its **force** is **greatly increased,** so much so that after large doses the heart may, in animals, be seen to become pale, because every drop of blood is squeezed out of it. The pulse is consequently increased in force, but retarded. If before the drug was given the heart was beating irregularly, it generally becomes **regular.** If a larger dose is given, it is observed that the intense systolic contraction is not uniform all over the organ. The auricles and ventricles do not beat synchronously; and even one portion—as the apex, for example—of the ventricle may remain spasmodically contracted during the diastole of the rest of the ventricle. This causes the heart to assume hour-glass and other curious shapes. Finally it is arrested in systole, and is firmly contracted, quite pale, and unable to respond to any mechanical or electrical stimuli. This account is true for all animals, except that sometimes in dogs and men the heart finally stops in diastole.

That these phenomena are chiefly due to the **direct action** of the drug on the **cardiac muscles** is shown by the fact that digitalis not only acts when applied locally to the heart, but will even increase the force of the contraction, when applied to the isolated apex in which it is believed no nerves exist. But the inhibitory activity of the cardiac peripheral end of the vagus is increased; for a mild stimulation of the vagi, which, before the drug was given had no effect, will after the drug is given stop the heart, and in warm-blooded animals digitalis does not very markedly retard the pulse, if the vagi have been cut, although it increases the force of the cardiac beat. Possibly to a slight extent the vagus centre in the medulla is stimulated, but the action of digitalis is to excite the cardiac muscle itself and [to a less degree] the cardiac inhibitory terminations of the vagus. Digitalis has been thought to affect the ganglia of the heart, but there is no satisfactory evidence of this.

It has been proved that even small doses actually **increase the amount of work** done by the heart in a given time.

Vessels.—Moderate doses of digitalis produce a **great rise**

direct action on their muscu
traction is greater in an intact an
cord is destroyed, or in whom the
imented upon are divided, it is c
lates the medullary and spinal v
toxic doses the irritation of the ce
of the arterioles passes on to depr
falls.

Kidney.—The effect of digital
tain. Most experimenters have fo
but some have not, and the same c
kidney exists in patients with heart
cases it is a **diuretic**. The reaso
that if the arterial vessels are, like
body, tightly contracted by the dr
to the kidney, and very little urin
digitalis does not constrict the
increased cardiac force and the ge
send more blood through the ki
secreted. Some observers state tha
a special effect in relaxing the vess
so, the question is still more com
influence of digitalis will depen

is still high, and then digitalis acts as a powerful diuretic. We have no certain knowledge of the effect of digitalis on the constitution of the urine.

Temperature.—Moderate doses have no influence on the temperature, but toxic doses cause it to fall even in health. The reason of this is unknown.

Respiration.—This is unaffected by digitalis unless poisonous doses have been given, when it begins to fail from the imperfect circulation through the respiratory mechanism.

Nervous system and muscles.—Medicinal doses have no marked influence. Large doses will, because of the alterations in the cerebral circulation, cause headache, giddiness, and disturbances of sight and hearing. In many cases of poisoning all objects have appeared blue.

The reflex activity of the cord and motor nerves is depressed independently of the action on the circulation; sensory nerves are unaffected. Digitalis directly paralyzes muscles if given in toxic doses.

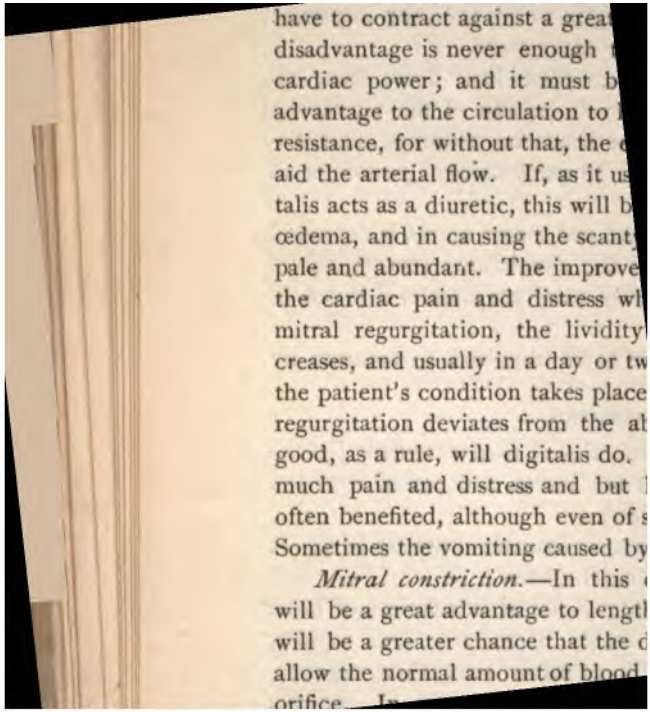
Uterus.—This organ is said to be stimulated to contract by digitalis.

THERAPEUTICS.

External.—Digitalis is [sometimes] used externally [in the form of a poultice made from the leaves, and placed over the loins in cases of renal congestion].

Internal.—It is one of the most valuable drugs we have. It is chiefly given in cases of cardiac disorder.

Mitral regurgitation.—If in any case of this variety of heart disease the organ is beating feebly, irregularly, and rapidly, digitalis in moderate doses will probably strengthen, regulate, and slow the beat. It will cause the left ventricle to contract more forcibly and to act synchronously in all its parts; hence the mitral flaps will be better approximated, the regurgitation will be less, and more blood will be sent on into the arterial circulation. The prolonged diastole will also be of great advantage, for it will allow more time for the blood to flow from the dilated auricle, and from the right side of the heart and venous



have to contract against a great
disadvantage is never enough t
cardiac power; and it must b
advantage to the circulation to l
resistance, for without that, the c
aid the arterial flow. If, as it us
talis acts as a diuretic, this will b
œdema, and in causing the scant
pale and abundant. The improve
the cardiac pain and distress wh
mitral regurgitation, the lividity
creases, and usually in a day or tw
the patient's condition takes place
regurgitation deviates from the ab
good, as a rule, will digitalis do.
much pain and distress and but
often benefited, although even of s
Sometimes the vomiting caused by

Mitral constriction.—In this
will be a great advantage to lengt
will be a greater chance that the d
allow the normal amount of blood
orifice. In

tion and tricuspid regurgitation, digitalis will be beneficial in the same way as in similar affections of the mitral valve.

Aortic regurgitation.—As a rule digitalis is harmful, for by prolonging the diastole more time is allowed for the blood to flow back through the imperfectly closed aortic orifice, and hence there is great danger of fatal syncope. The drug should only be given in cases of aortic regurgitation when the heart is very rapid, or when there is evidence that not much blood regurgitates, or when there are reasons, such as the coincident presence of aortic obstruction, for wishing to strengthen and regulate the contraction. The dose must be small and the effects must be carefully watched.

Aortic constriction.—This, unfortunately, is usually accompanied by aortic regurgitation; but sometimes when it is wished to increase the force of the beat, and so to drive more blood through the constricted aortic orifice, digitalis is useful, or when, as a result of the obstruction, mitral dilatation and consequent regurgitation, with much pulmonary and venous engorgement, have set in. Many cases of pure aortic obstruction do not require drugs, for the heart hypertrophies sufficiently to overcome the obstruction.

Bright's disease.—In cases of contracted granular kidney in which the cardiac hypertrophy has been unable to overcome the peripheral resistance, and consequently the left ventricle and with it the auriculo-ventricular orifice has dilated, and mitral regurgitation has therefore ensued, digitalis may be of service for the reasons given on p. 363. A diuretic pill, often used for this condition, consists of calomel, digitalis, and squill, a grain of each; .06 gm. made up with extract of [hyoscyamus.] Otherwise in chronic Bright's disease, digitalis is not a suitable diuretic, for it raises the tension of the pulse, which is already high. In the earlier stages of acute Bright's disease it has been given as a diuretic, but it is questionable whether it is right to dilate the vessels of an acutely inflamed organ; further, digitalis is always, unless the heart is diseased, an uncertain diuretic, and even in the early stage of acute Bright's disease the arterial tension is somewhat

raised. In chronic tubal nephritis, uncomplicated by cardiac disease, it is worse than useless, for it has no effect on the renal cells, and it raises the blood-pressure.

Diseases of the cardiac muscle.—If the heart be fatty, digitalis does no good; it is indeed said that there is danger of rupture of some of the softened fatty fibres. The weakly acting heart that is met with after pericarditis, typhoid fever, scarlet fever, rheumatism, and other acute diseases, even if no valvular defects are present, is markedly strengthened by digitalis. Each contraction is more efficient, and the prolonged diastole allows more time for the muscle to rest. It is clear that in the course of twenty-four hours this additional repose, although but little in each cycle, will amount to a considerable time. Many men who have practiced rowing or other hard exercise to excess, suffer from shortness of breath, and the apex of the heart is found to be a little outside the normal position, but there is no demonstrable valvular lesion. This condition, which also occurs in soldiers after a long campaign, is much benefited by digitalis. The dilatation of the right side of the heart that so frequently accompanies chronic disease of the lungs may be, but usually is not improved by digitalis.

Functional disease[s] of the heart.—The irregular, palpitating beat, often seen apart from any organic disease, may be benefited markedly by digitalis; but it must be remembered that this condition is commonly a result of indigestion, in which case the right treatment is, if possible, to cure the dyspepsia, and if digitalis is given at all, to do so cautiously, for it may excite indigestion. The functional affections of the heart met with in highly neurotic subjects may be, but are not always benefited by digitalis.

Exophthalmic goitre may improve under a long course of digitalis, but generally this treatment fails.

Hæmorrhage.—Although digitalis contracts the arterioles it is not often given as a hæmostatic, for the increased blood-pressure may lead to greater hæmorrhage, but it may be useful in the pulmonary hæmorrhage, due to disease of the mitral valve.

Alcoholism.—Moderate doses of digitalis have been said to be serviceable in chronic alcoholism on account of their stimulating effect on the circulation. Enormous doses have been given empirically in delirium tremens, but generally without any good result.

Uterus.—Because of its power to contract the uterus, digitalis may be useful in menorrhagia.

It is often desirable to combine fluid preparations of digitalis with salts of iron, the resulting mixture, which is usually inky from the action of the iron on the tannin in the digitalis, can be clarified by the addition of a little diluted phosphoric acid. Because of this difficulty the powdered digitalis leaves are often made into a pill with dried [ferrous] sulphate.

ANTAGONISMS.

Antagonism between *Digitalis and Aconite.*—Aconite is a cardiac poison, weakening instead of strengthening the beat; it dilates the peripheral vessels, it lowers the blood-pressure, and after death the heart is always found in a condition of diastole. In all these points it is antagonistic to Digitalis. The action of Aconite is very rapid, that of Digitalis very slow. Therefore these drugs are not practical antidotes to each other in poisoning.

Scoparin is also physiologically antagonistic to Digitalis.

Digitalis is **cumulative.** Patients who have taken it for a long while sometimes suddenly show symptoms of poisoning without any increase in the dose. This is because the drug is not excreted by the kidneys so fast as it is absorbed, therefore it accumulates in the body.

STROPHANTHUS.

[**STROPHANTHUS.**—The seed of *Strophanthus hispidus* De Candolle (nat. ord. *Apocynaceæ*), deprived of its long awn. *Habitat.*—Tropical Africa.

CHARACTERS.—About 15 mm. long and 4 or 5 mm. broad, oblong-lanceolate, flattened and obtusely edged, grayish-green, covered with appressed, silky hairs, one side with a ridge extending into the attenuated, pointed end; kernel white and oily, consisting of a straight embryo, having two thin cotyledons, and surrounded by a thin layer of perisperm; nearly inodorous; taste very bitter.]

COMPOSITION.—The chief constituents are—(1) *Strophanthin*, [$C_{31}H_{48}O_{12}$.] It exists in all parts of the plant, but mostly in the seeds. It is a transparent, white, imperfectly crystalline, bitter glucoside (being split up by acids into

glucose and *Strophanthidin*). Soluble in water; insoluble in Chloroform and Ether. [*Strophanthin* is not, according to recent investigation, contained in *Strophanthus hispidus*, but can be isolated from *Strophanthus Kombé*. (2) *Kombic Acid*, which is not identical in both varieties of *Strophanthus*. (3) *Inéine*, an Alkaloid. (4) Tanghinin, $C_{27}H_{40}O_8$, in rhombic prisms.

Preparation.

Tinctura Strophanthi.—Tincture of Strophanthus. Strophanthus, 50. By digestion and percolation with Alcohol and water to 1000. **Dose, 2 to 10 m.; .12 to .60 c.c.**]

ACTION.

External.—None.

Internal.—*Gastro-intestinal tract.* Like digitalis, strophanthus is liable to cause **vomiting and diarrhœa,** especially if the dose be large. In small doses its bitter action may come into play, and then it will aid digestion like any other bitter stomachic.

Heart.—Strophanthus acts on the **heart exactly like digitalis,** for it strengthens the force without altering the duration of the systole, slows the rate of the beat, and consequently prolongs the diastole, and makes an irregular heart regular. In fatal cases of poisoning by strophanthus, the heart may be arrested either in diastole or systole. The details of its cardiac action are the same as those of digitalis.

Vessels.—It does **not constrict the peripheral vessels,** or at any rate very slightly; therefore, the slow rise of blood-pressure is almost entirely due to the action of the drug on the heart. This is the most important difference between it and digitalis, which contracts the vessels powerfully and consequently gives a greater rise of blood-pressure.

Kidneys.—It is diuretic, but not nearly so powerful as digitalis. Probably the diuresis is entirely due to the increased cardiac action. No special alteration in the size of the renal vessels takes place under strophanthus.

Nervous system.—This is not affected. In toxic doses it is a direct poison to the voluntary muscles. Strophanthin is a powerful anæsthetic when dropped on the conjunctivæ.

Respiration.—No particular effect is produced. The African Kombé arrow poison is made from strophanthus.

Therapeutics.

Strophanthus is used in the same varieties of cardiac disease as digitalis; that is to say, when it is desirable to slow the heart, to increase its force, to make it regular, and to prolong the diastole. It is clear, therefore, that it will be chiefly valuable in cases of mitral disease. *A priori*, it might be thought that as strophanthus does not contract the peripheral vessels and so increase the cardiac resistance, consequently it would be the more useful drug, but experience has not confirmed this, and in the treatment of a case of heart disease, digitalis should be used first; but if the patient does not improve on this, then strophanthus may be tried. It will sometimes happen that strophanthus will not produce vomiting when digitalis does, but there are many individual differences. Digitalis should be given whenever a diuretic effect is desired; but strophanthus, as it does not constrict the peripheral vessels, is preferable when it is wished to give one of these drugs to a patient suffering from chronic Bright's disease. Strophanthus is not cumulative. It has been recommended in exophthalmic goitre.

CONVALLARIA.

[**CONVALLARIA.**—The rhizome and roots of *Convallaria majalis* Linné (nat. ord. *Liliaceæ*). *Habitat.*—United States, in the Allegheny Mountains; Europe and Northern Asia.

Characters.—Of horizontal growth and somewhat branched, about 3 mm. thick, cylindrical, wrinkled, whitish, marked with few circular scars; at the annulate joint with about eight or ten long, thin roots; fracture somewhat fibrous, white; odor peculiar, pleasant; taste sweetish, bitter, and somewhat acrid.]

Composition.—The chief constituents are—(1) *Convallamarin*, $C_{46}H_{44}O_{24}$, a glucoside the active principle; [a white bitter-sweet powder, soluble in water and Alcohol. (2) *Convallarin*, $C_{34}H_{31}O_{11}$, a glucoside, in acrid prisms, sparingly soluble in, but foaming with water, soluble in Alcohol, but not in Ether.

Preparation.

1. **Extractum Convallariæ Fluidum.**—Fluid Extract of Con-

vallaria. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 5 to 30 m; .30 to 2.00 c.c.]

Action and Therapeutics.

The action of Convallaria is precisely that of digitalis, and it may be given in exactly the same varieties of heart disease. It is sometimes successful when digitalis has failed. It is not so powerful as digitalis, but some find it less likely to produce sickness. [A more extended experience seems to indicate that this drug is very unreliable.]

SCILLA.

[**SQUILL.**—The bulb of *Urginea maritima* (Linné) Baker (nat ord. *Liliaceæ*), deprived of its dry, membranaceous outer scales, and cut into thin slices, the central portions being rejected. *Habitat.*—Basin of the Mediterranean near the sea.

Characters.—In narrow segments, about 5 cm. long, slightly translucent, yellowish-white or reddish, brittle and pulverizable when dry, tough and flexible after exposure to damp air; inodorous; taste mucilaginous, bitter and acrid.]

Composition.—The chief constituents are—(1) *Scillitoxin*, the most active principle; (2) *Scillipicrin*, acting upon the heart; (3) *Scillin*, producing numbness and vomiting; (4) Mucilage.

Dose, 1 to 5 gr.; [.06 to .30 gm.]

Preparations.

1. **Acetum Scillæ.**—[Vinegar of Squill. Squill, 100; diluted Acetic Acid, by maceration and percolation, to 1000.

Vinegar of Squill is used to prepare Syrupus Scillæ.

Dose, 10 to 45 m.; .60 to 3.00 c.c.

2. **Extractum Scillæ Fluidum.**—Fluid Extract of Squill. By maceration and percolation with Alcohol and water, and evaporation.

Fluid Extract of Squill is used to prepare Syrupus Scillæ Compositus.

Dose, 1 to 5 m.; .06 to .30 c.c.

3. **Tinctura Scillæ.**—Tincture of Squill. Squill, 150. By maceration and percolation with Alcohol and water, to 1000.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

4. **Syrupus Scillæ.**—Syrup of Squill. Vinegar of Squill, 450; Sugar, 800; water to 1000. By solution and straining.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

5. Syrupus Scillæ Compositus.—Compound Syrup of Squill. *Synonym.*—Hive Syrup. *See* Antimony, p. 210.]

ACTION.

Squill so closely **resembles digitalis** in its action that the account of that drug will apply to squill, with the following additions: Squill is a much **more powerful gastro-intestinal irritant**; vomiting and purging result from even moderate doses, and after death, if animals are killed with it, much gastro-enteritis is found. In the second place, some constituent of squill is excreted by the bronchial mucous membrane, and in passing through it irritates it. The vascularity and the amount of secretion are thereby increased. Squill is, therefore, a powerful **expectorant**. Thirdly, squill in the course of its excretion through the kidneys stimulates them; it is, therefore, a **more energetic diuretic** than digitalis, and it may irritate the kidneys excessively.

THERAPEUTICS.

Because of its irritating properties, squill is not given alone, but it is frequently combined with digitalis when that drug is administered for heart disease or as a diuretic. A very favorite diuretic pill is composed of squill, digitalis and calomel, 1 gr. [.06 gm.] of each, made up [with extract of hyoscyamus 1½ gr.; .09 gm.]

Squill is much used as an expectorant. Here also it is always prescribed in combination; it is too irritating to the bronchial mucous membrane for it to be advisable to give it in acute bronchitis; nor should it be chosen in phthisis, lest it should cause dyspepsia; but it is valuable in chronic bronchitis if the secretion is scanty.

Squill should not be given in acute Bright's disease, for it is too irritating to the kidneys.

[SPARTEINÆ SULPHAS.

SPARTEINE SULPHATE.—$C_{15}H_{26}N_2H_2SO_4+4H_2O=403.23$.

SOURCE.—The neutral sulphate of an alkaloid obtained from Scoparius (*q. v.*). Sparteine, the alkaloid, is obtained by extracting the plant with water

acidulated with Sulphuric Acid, concentrating, decomposing with Sodium Hydroxide, and distilling. The Sulphate is prepared from the Alkaloid by neutralization with Sulphuric Acid, and crystallizing.

CHARACTERS.—Colorless, white, prismatic crystals, or a granular powder, odorless, and having a slightly saline and somewhat bitter taste. Liable to attract moisture when exposed to damp air. *Solubility.*—Very soluble in water and Alcohol.

Dose, $\frac{1}{10}$ to 2 gr. ; .006 to .12 gm.

ACTION AND USES.

Poisonous doses of sparteine sulphate cause, in the lower animals, tremblings, inco-ordination, increase of reflexes, clonic and tonic convulsions, embarrassment of the respiration, acceleration of the pulse, and enfeeblement of the heart, followed by enfeeblement of all the functions, convulsions, and death from asphyxia. It paralyzes the respiratory centres and the motor centres of the spinal cord, but has a very feeble influence upon the muscles, lessening, though not destroying, their excitability. According to Laborde, under the influence of this alkaloid there is a very great increase in the size and height of the cardiac wave. If the dose has been a small one, the pulse is at first accelerated ; after large doses there is a slowing. The arterial pressure is not materially changed unless the dose is toxic, when it falls. Small doses weaken, and large ones paralyze the peripheral pneumogastric nerve ; upon the vaso-motor system it appears to have no influence, unless in very large toxic doses, when it, perhaps, acts as a paralyzant. It does not represent entirely the diuretic action of scoparius. According to Sée, sparteine is of very great value in producing regularity in cases of irregular cardiac action. It accelerates the beats when in a weak, atonic state, and has the great advantage of acting quickly, is not cumulative, but on the whole is probably inferior to digitalis in power, but it is useful in uncompensated heart disease.]

CLASS II.

ACONITUM.

[**ACONITE.**—The tuber of *Aconitum Napellus* Linnè (nat. ord. *Ranunculaceæ*). *Habitat.*—Mountainous districts of Europe, Asia, and Northwestern North America.

CHARACTERS.—From 10 to 20 mm. thick at the crown; conically contracted below; from 50 to 75 mm. long, with scars or fragments of radicles; dark brown externally; whitish internally; with a rather thick bark, the central axis about seven-rayed; without odor; taste at first sweetish, soon becoming acrid, and producing a sensation of tingling and numbness, which lasts for some time.] *Resembling Aconite.*—Horseradish (*q. v.*).

COMPOSITION.—The active principle is the very poisonous alkaloid *Aconitine* (*see* [Appendix]). Other principles are, perhaps, *Pseudo-aconitine*, [$C_{36}H_{49}NO_{11}$, *Aconine*, $C_{26}H_{39}NO_{11}$, *Pseudo-aconine*, $C_{27}H_{41}NO_8$, *Picro-aconitine*, $C_{31}H_{45}NO_{10}$, combined with Aconitic Acid, $H_3C_6H_3O_6$.]

Dose, ½ to 2 gr.; [.03 to .12 gm.]

Preparations.

[1. **Extractum Aconiti.**—Extract of Aconite. By maceration and percolation with Alcohol, and evaporation.

Dose, $\frac{1}{10}$ to ¼ gr.; .006 to .015 gm.

2. **Extractum Aconiti Fluidum.**—Fluid Extract of Aconite. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ½ to 2 m.; .03 to .12 c.c.

3. **Tinctura Aconiti.**—Tincture of Aconite. Aconite, 35. By maceration and percolation with Alcohol and water to 1000.

Dose, ½ to 5 m.; .03 to .30 c.c.

It should be remembered that Fleming's Tincture of Aconite, which is found in the shops, is nearly twice as strong as the official tincture.]

ACTION.

External.—Applied to the skin, to a mucous membrane, or to a raw surface, aconite or its alkaloid first stimulates and then paralyzes the nerves of touch and temperature; it therefore causes first **tingling**, then **numbness and local anæsthesia**, which last some time.

Internal.—*Gastro-intestinal tract.*—Unless it is very dilute, numbness and tingling are produced in the mouth. There are no other gastro-intestinal symptoms unless the dose is very large, when there may be vomiting.

Heart.—The rate of the beat may be at first a little increased by aconite, but soon the pulse is very decidedly **slowed**, shortly after that the **force and tension** become **less.** Finally the

heart is arrested in diastole. It is certain that towards the end of its action aconite influences the heart itself, for it will retard the excised organ when applied directly to it. It is extremely probable that in the earlier stages the drug acts upon the cardiac nerves or their centres, but the details of such action are not known. The effect on the heart leads to a **fall of blood-pressure**, but whether this is partly due to an action on the vaso-motor system itself, is undecided.

Respiration.—The rate of respiration is **slowed**, expiration and the pause after it are considerably prolonged. This is chiefly due to the action of aconite on the centre in the medulla, but in part to the paralysis of the peripheral endings of the afferent vagal fibres.

Nervous system.—The evidence is very conflicting, but it appears clear that aconite, whether given internally or applied locally, **depresses** the activity of the peripheral **terminations** of the nerves; the **nerves of common sensation and temperature** are affected before the motor. Any **pain** that may be present is **relieved.** Later on, the paralysis of the motor nerves gives rise to muscular weakness. It is doubtful whether the cord is influenced. The brain is not.

Temperature.—Aconite causes a febrile temperature to **fall.** The cause of this is not known.

Skin.—Aconite is a mild **diaphoretic**; in this case also we do not understand how it acts. Occasionally it produces an erythematous rash.

Kidneys.—It is said to be a feeble diuretic, but its effect is very slight. We do not know the channel by which it is eliminated.

Therapeutics.

External.—As aconite produces local anæsthesia, it is applied externally and often with great benefit in cases of neuralgia, especially facial neuralgia. Frequently it fails, and we cannot tell beforehand whether it will succeed. A small piece of the ointment [B. P., aconitine, 2; alcohol, 7; benzoinated lard, 100] may be rubbed in till numbness is produced, but as this is a very

xpensive preparation it is usually better to paint on the liniment P., a 40 per cent. solution of the root in alcohol, to which 2 cent. of camphor is added], with a camel's-hair brush. The f chronic rheumatism is sometimes relieved by aconite.

ernal.—It may be given internally for neuralgia, but it succeed nearly so well as when applied externally. It internally as much as formerly, when it was admin- most every febrile disease, with the object of decreas- force and tension of the pulse. Certainly it does this y effectually, and the only reason why it is not so popular at the present time is, that it is not now thought desirable to reduce the force and frequency of the heart in these diseases. Perhaps it is used too little, for many believe that the milder febrile diseases, such as tonsillitis, laryngitis, or a common cold, are distinctly benefited by aconite. In addition to retarding the pulse it increases perspiration and lowers the temperature. As large doses diminish the force of the heart, it is usually given in doses of two or three minims [.12 or .20 c.c.] of the tincture every hour or so till the pulse falls to nearly normal; for the same reason it is not advisable to use it for prolonged fevers, as typhoid, nor when the heart is diseased, except in the few cases in which there is sufficient compensative cardiac hypertrophy. In such cardiac cases it is sometimes useful to slow the pulse, even when there is no fever. It will occasionally relieve the pain of aneurism. A common practice was to combine with it one or two minims; [.06 or .12 c.c.] of Vinum Antimonii, as that has much the same action on the heart. Formerly it was much used in surgery if it was feared that inflammation might set in after injuries.

TOXICOLOGY.

The symptoms come on quickly; in a few minutes there is a severe burning, tingling, sensation in the mouth, followed by numbness. Vomiting begins in an hour or so, and is very severe. There is an intense abdominal burning sensation. The skin is cold and clammy. Numbness and tingling, with a sense of formication of the whole skin, trouble the patient very much. The pupils are dilated, the eyes fixed and staring. The muscles become very feeble, hence he staggers. His pulse is small, weak and irregular. There is difficulty of

respiration. Death takes place from asphyxia, or in some cases from syncope. He is often conscious to the last. *Post-mortem.*—The usual signs of death from asphyxia are seen.

Treatment.—Wash out the stomach promptly, give emetics (see p. 128), inject stimulants, as ether or brandy, subcutaneously; apply warmth. Atropine and the tincture of digitalis should be given subcutaneously.

VERATRUM VIRIDE.

[**VERATRUM VIRIDE.**—*Synonym.*—American Hellebore. The *rhizome and roots of Veratrum viride* Solander (not. ord. *Liliaceæ*). *Habitat.*—North America, in rich woods.

CHARACTERS.—Rhizome upright, oblong-conical, simple or divided, from 3 to 8 cm. long, and 2 to 4 or 5 cm. thick, externally blackish-gray, internally grayish-white, showing numerous short, irregular wood-bundles. Roots emanating from all sides of the rhizome, numerous, shrivelled, light yellowish-brown, about 10 to 20 cm. long, and 2 mm. thick. Inodorous, but strongly sternutatory when powdered; taste bitterish and very acrid.] *Resembling Veratrum.*—Valerian, serpentaria, and arnica, but Veratrum has thicker rootlets, and no odor.

COMPOSITION.—The chief constituents are—(1) *Jervine* [$C_{26}H_{37}NO_3$, an alkaloid, non-sternutatory. (2) *Pseudojervine*, an alkaloid resembling Jervine. (3) *Veratroidine*, sometimes called Cevadine, uncrystallizable, and sternutatory, is probably mostly Rubijervine. (4) Traces of *Rubijervine*. (5) Resin.]

Dose, 1 to 5 gr.; [.06 to .30 gm.]

Preparations.

[1. **Extractum Veratri Viridis Fluidum.—Fluid Extract of Veratrum Viride.** By maceration and percolation with Alcohol, and evaporation.

Dose, 1 to 5 m.; .06 to .30 c.c.]

2. **Tinctura Veratri Viridis.**—[Tincture of Veratrum Viride. Veratrum Viride, 400. By maceration and percolation with Alcohol to 1000.

Dose, 2 to 10 m.; .12 to .60 c.c.

It should be remembered that the dose of Norwood's Tincture of Veratrum Viride, which is found in the shops, is 5 m.; .30 c.c., gradually increased.]

ACTION.

The action of veratrum viride is very complex, as it contains so many alkaloids, but experiments have only been made on two active principles. These are **jervine**, and a substance, **vera-**

troidine, which further analysis shows to consist chiefly of rubijervine, resin, and, perhaps, some other bodies. Jervine, veratroidine, and veratrum viride will be considered separately.

Jervine.—*Gastro-intestinal tract.*—When administered internally this substance produces profuse salivation, but neither vomiting nor purging.

Circulation.—The pulse is markedly **lessened** in frequency if the animal is quiet, but often the convulsions produced by the jervine cause a rapid pulse. The force of the cardiac beat is not at first altered. The **blood-pressure falls** at once, and continues to fall till death. Experiments made by excluding different parts show that these effects are produced by a powerful **direct depressant effect on the cardiac muscle itself,** and that the **vaso-motor nerve-centres** are powerfully **paralyzed.**

Respiration.—This is profoundly depressed, and death takes place from **asphyxia.**

Nervous system.—Early in the case there is **muscular weakness,** and this becomes more and more marked, so that the animal cannot stand, and reflex action is abolished. Yet, weak as these muscles are, they are soon violently **convulsed,** and it is found that jervine produces these apparently contrary effects by energetically stimulating the cerebral motor centres, but at the same time paralyzing the anterior cornual cells of the spinal cord, although not sufficiently to prevent the very strong impulses from the cerebral centres reaching the muscles and causing convulsions. The muscles themselves, and the motor and sensory nerves are not affected; or if they are, they are depressed a little, just before death. Consciousness and the pupils are uninfluenced.

Veratroidine.—*Gastro-intestinal tract.*—This substance always produces vomiting and sometimes purging.

Circulation.—At first it **lessens** the pulse-rate because it stimulates the pneumogastrics, consequently the blood-pressure falls, and if artificial respiration is kept up these effects continue till, if very large doses have been given, the stimulation of the

vagi passes into paralysis and then the pulse rises in freq
Veratroidine probably has no action on the vaso-motor c
Its influence on the respiratory centres is so intense that i
ficial respiration is not maintained, the effects of the asphy
mask those of the drug on the vagi, that the blood-pressure
and the pulse becomes rapid.

Respiration.—The function of respiratory centres is powe
depressed, the animal soon becomes **asphyxiated** and

Nervous system.—The action is the same as that of je

Veratrum Viride.—The symptoms produced by this
in man are as follows. They are easily explained by the
bined action of jervine and veratroidine:—The frequenc
force of the **pulse** are profoundly **depressed**. There m
severe nausea and vomiting. After larger doses the puls
comes very feeble and uneasy, there is difficulty of respir
and intense muscular weakness. Convulsions are not con
in man. The temperature may fall several degrees.

THERAPEUTICS.

It is the opinion of most authorities that veratrum v
should be prescribed with great caution as it is such a pow
poison. It has been given as a cardiac depressant, but antim
and aconite are much safer. Some have, however, claimed
it is a better cardiac depressant than aconite, because the vo
ing it induces quickly indicates that too large a dose has b
administered; but if the pulse is carefully watched too m
aconite need not be given, and the vomiting itself is object
able.

VERATRINA.

[**VERATRINE.**—A mixture of alkaloids obtained from the see
Asagræa officinalis (Schlechtendal et Chamisso), Lindley (nat. ord. *Lilia*
Habitat.—Mexico to Venezuela.]

SOURCE.—(1) The seed is exhausted with Alcohol, and the Alcoho
covered by distillation. (2) The residuary liquid is diluted with wat
precipitate the resins and filtered. (3) Ammonia is added to the filtrate, w
veratrine is precipitated. (4) It is then redissolved, decolorized, and re
cipitated.

CHARACTERS.—[A white or grayish-white, amorphous or semi-crystalline powder, odorless, but causing intense irritation and sneezing when even a minute quantity reaches the nasal mucous membrane; having an acrid taste, and leaving a sensation of tingling and numbness on the tongue; permanent in the air. *Solubility.*—Very slightly soluble in water; soluble in 3 parts of Alcohol; also soluble in 6 parts of Ether, and in 2 parts of Chloroform.

Dose, $\frac{1}{30}$ to $\frac{1}{10}$ gr.; .002 to .006 gm.

Preparations.

1. **Oleatum Veratrinæ.**—Oleate of Veratrine. Veratrine, 2; Oleic Acid, 98.

2. **Unguentum Veratrinæ.**—Veratrine Ointment. Veratrine, 4; Olive Oil, 6; Benzoinated Lard, 90.]

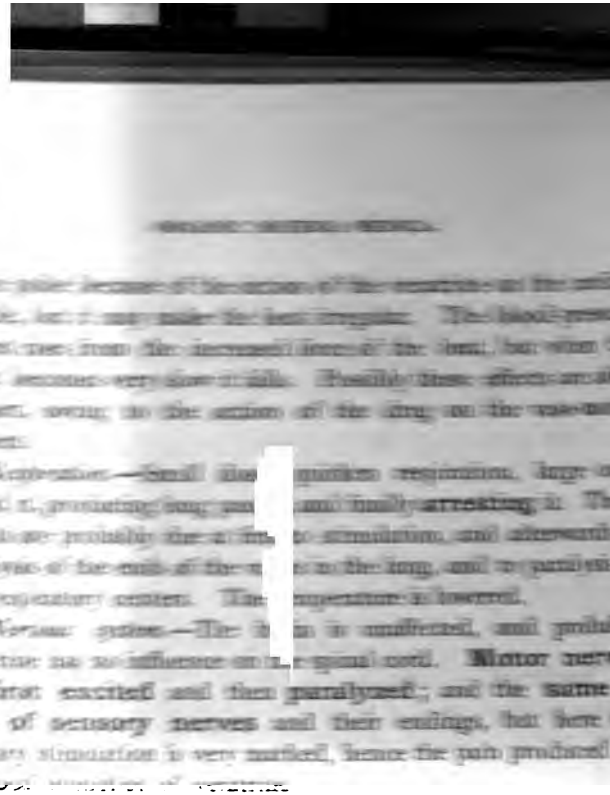
ACTION.

External.—Veratrine has no effect when applied to the unbroken skin, but it is a powerful **irritant** when rubbed in; it then causes a feeling of warmth, followed by pricking, severe pain, and finally numbness. There is at the same time considerable hyperæmia.

Internal.—*Gastro-intestinal tract.*—Its irritant action is even more marked on mucous membranes than on the skin. Inhalation of the minutest portion causes great irritation of the mucous membrane of the nose, violent **sneezing,** and a free **discharge of mucus,** which may be bloody. A minute portion upon the tongue gives rise to burning pain and profuse **salivation.** On arriving at the stomach and intestine it produces great **epigastric pain, vomiting and diarrhœa.**

Blood.—Veratrine is quickly absorbed. It is not known to affect the living blood, but it kills the white corpuscles in drawn blood.

Heart.—It acts directly on the cardiac muscle as it does upon voluntary muscle; that is to say, the **contractions** of the heart become **fewer,** but each **lasts a very long while** until ultimately the heart stops in systole. It also acts on the **vagus** as on spinal nerves, the functional activity being **first exalted,** and this is partly the reason of the slowing of the heart; afterwards the vagus is depressed, but this does not cause a quickening



enormously prolonged.

Therapeutics.

External. *Veratrine* as an oleate or ointment has been much used as an *inunction* for neuralgia, and sometimes it succeeds admirably, generally in the same class of cases as are benefited by the local application of aconite.

Internal. It is rarely given internally, as it has such powerful and peculiar action on the heart.

GROUP III.

Vegetable Drugs employed for their Action on the Respiratory Organs and not falling among Volatile Oils (*q. v.*).

Senega, Sanguinaria, Pulsatilla, Ipecacuanha, Allium, Lobelia, Grindelia, Asclepias, Castanea, Inula, Aspidosperma, Eridictyon.

These are all gastro-intestinal irritants. Senega and Ipecacuanha are both excreted by the bronchial mucous membrane, which they irritate. Group II. is connected with this group by Senega, which acts on the heart like Squill, and like it is excreted by the bronchial mucous membrane.

SENEGA.

[**SENEGA.**—The root of *Polygala Senega* Linné (nat. ord. *Polygaleæ*). *Habitat.*—United States, westward to Minnesota.

CHARACTERS.—About 10 cm. long, with a heavy knotty crown, and spreading, tortuous branches, keeled when dry, fleshy and round after having been soaked in water; externally yellowish gray or brownish-yellow; bark thick, whitish within, enclosing an irregular, porous, yellowish wood; odor slight, but unpleasant; taste sweetish, afterwards acrid.] *Resembling Senega root.*—Arnica, Valeriana, Serpentaria and Green Hellebore, but none of these have a keel.

COMPOSITION.—The active principle in *Senegin* ($C_{32}H_{54}O_{18}$). Also called *Saponin*, which is found in Quillaja (*q. v.*). It is a colorless amorphous glucoside, insoluble in Alcohol, but forming a soapy emulsion when mixed with boiling water, and is decomposed by Hydrochloric Acid into glucose and *Sapogenin*. It acts like Digitonin, and is found in many plants.

IMPURITIES.—Other roots are mixed with it.

Dose, 10 to 20 gr.; [.60 to 1.20 gm.]

Preparations.

[1. **Extractum Senegæ Fluidum.**—Fluid Extract of Senega. By maceration and percolation with Alcohol, Ammonia Water and water, and evaporation.

Dose, 10 to 20 m.; .60 to 1.20 c.c.

2. **Syrupus Senegæ.**—Syrup of Senega. Fluid Extract of Senega, 200; Ammonia Water, 5; Sugar, 700; water to 1000. Filter before adding the Sugar.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

3. **Syrupus Scillæ Compositus.**—*See* Antimony, p. 210.]

Action.

External.—Saponin (and hence senega) is an **irritant** to the skin.

Internal.—*Alimentary canal.*—Senega in large doses is an **irritant** here also, producing salivation, vomiting, and diarrhœa. Even small doses often cause indigestion. It is absorbed with difficulty.

Circulation.—Saponin circulates as such in the blood. It affects the **heart like digitalis,** but not so certainly. It is excreted by the skin, the bronchial mucous membrane, and the kidneys.

Respiration.—When the powdered root is inhaled it acts as a violent irritant to the nose, causing much **sneezing** and cough, together with hyperæmia and increased secretion from the respiratory mucous membrane. If senega is taken internally, it also irritates the bronchial mucous membrane during its excretion through it, causing vascular dilatation, greater secretion, and reflexly, cough. It is, therefore, a **stimulating expectorant.**

Kidney.—It is a diuretic, and during its excretion through the kidney causes irritation of it.

Therapeutics.

Senega is only used as a stimulating expectorant. It is evident that it will be useful in bronchitis, when the secretion is scanty, and when the power to cough is feeble. As it is an irritant to the bronchial mucous membrane, it must not be given in acute bronchitis, nor, on account of its gastro-intestinal action, when there is indigestion. It has been employed as a diuretic, but it is not powerful, and is uncertain.

[SANGUINARIA.

SANGUINARIA. *Synonym.*—Bloodroot. The rhizome of *Sanguinaria canadensis* Linné (nat. ord. *Papaveraceæ*), collected in autumn. *Habitat.*—North America, in rich woods.

Characters.—Of horizontal growth, about 5 cm. long, and 1 cm. thick, cylindrical, somewhat branched, faintly annulate, wrinkled, reddish-brown; fracture short, somewhat waxy, whitish, with numerous small, red resin-cells,

or of a nearly uniform, brownish-red color; bark, thin; odor, slight; taste persistently bitter and acrid.

COMPOSITION.—Its chief constituents are: (1) *Sanguinarine*, $C_{20}H_{15}NO_4$, a white substance, soluble in Alcohol. (2) *Chelerythrine*, $C_{21}H_{17}NO_4$. (3) *Protopine*, $C_{20}H_{17}NO_5$, also present in Opium. (4) *Homochelidonine*, $C_{22}H_{21}NO_4$. (5) Resins. (6) Citric and Malic Acids.

Dose, 2 to 30 gr.; .12 to 2.00 gm.

Preparations.

1. **Extractum Sanguinariæ Fluidum.**—Fluid Extract of Sanguinaria. By maceration and percolation with Alcohol water and Acetic Acid, and evaporation.

Dose, 1 to 5 m.; .06 to .30 c.c. (expectorant); ½ to 1 fl. dr.; 1. to 4. c.c. (emetic).

2. **Tinctura Sanguinariæ.**—Tincture of Sanguinaria. Sanguinaria, 150; by maceration with Alcohol, Acetic Acid and water, and percolation to 1000.

Dose, 5 to 30 m.; .30 to 2.00 c.c. (expectorant); 1 to 4 fl. dr.; 4. to 15. c.c. (emetic).]

ACTION AND USES.

Sanguinaria is an acrid emetic with stimulant, narcotic powers; it is also expectorant and said to be an emenagogue. It is chiefly used as a stimulating expectorant in chronic bronchitis or in advanced stages of the acute disease.

PULSATILLA.

PULSATILLA.—The herb of *Anemone Pulsatilla* and of *Anemone pratensis* Linné (nat. ord., *Ranunculaceæ*), collected soon after flowering. *Habitat.*—Europe.

CHARACTERS.—Leaves radical, petiolate, silky-villous, twice or thrice deeply three-parted or pinnately cleft, with linear, acute lobes, appearing after the large, purple flowers; inodorous, very acrid.

COMPOSITION.—The chief constituent is *Anemonin*, $C_{10}H_8O_4$, which is colorless, inodorous and, when distilled with water, acrid.

Dose, 1 to 5 gr.; .06 to .30 c.c.

ACTION AND USES.

It is said to be very nearly the equivalent of senega, and also to paralyze the heart and respiratory centres. It has been used in

asthma, convulsive coughs and in bronchitis. The fluid extract in dose, 1 to 5 minims; .06 to .30 c.c., has been highly recommended for orchitis and epididymitis.]

IPECACUANHA.

[**IPECACUANHA.**—Ipecac. The root of *Cephaëlis Ipecacuanha* (Brotero) A. Richard (nat. ord. *Rubiaceæ*). *Habitat.*—Brazil to Bolivia and New Granada, in damp forests; cultivated in India.

CHARACTERS.—About 10 cm. long and 4 or 5 mm. thick; mostly simple, contorted, dull grayish-brown or blackish, finely wrinkled; closely and irregularly annulated, and often transversely fissured; bark thick, brittle, brownish, easily separated from the thin, whitish, tough, ligneous portion; odor slight, peculiar, nauseous; taste bitterish, acrid, nauseating.]

COMPOSITION.—The chief constituents are—(1) *Emetine*, $C_{30}H_{40}NO_5$, from 1 to 2 per cent., the active principle. It is white (turns yellow on keeping), odorless, bitter, and soluble in Alcohol, Ether and Chloroform, slightly soluble in water. (2) *Ipecacuanhic Acid*. (3) An amorphous, bitter Glucoside. (4) Tannin, Volatile Oil, Starch, Gum, etc.

IMPURITIES.—Hemidesmus, which is cracked, not annulated. Almond Powder, occasionally found mixed with powdered Ipecacuanha root, gives odor of Prussic Acid when moistened.

Dose, of powdered root, ½ to 2 gm.; [.03 to .12 gm. (expectorant), 15 to 30 gr.; 1. to 2. gm. emetic.]

Preparations.

1. [**Extractum Ipecacuanhæ Fluidum.**—Fluid Extract of Ipecac. By maceration and percolation with Alcohol and water, distillation of the Alcohol, addition of water to residue, evaporation and addition of Alcohol.

Fluid Extract of Ipecacuanha is used to make Syrupus Ipecacuanhæ, Tinctura Ipecacuanhæ et Opii, and Vinum Ipecacuanhæ.

Dose, 1 to 5 m.; .06 to .30 gm.

2. **Pulvis Ipecacuanhæ et Opii.** See Opium, p. 299.

3. **Trochisci Ipecacuanhæ.** Troches of Ipecac. Ipecac, 2; Tragacanth, 2; Sugar, 95 gm.; Syrup of Orange, a sufficient quantity for 100 troches. Each troche contains .02 gm. Ipecacuanha.

Dose, 1 to 9 troches.

4. **Trochisci Morphinæ et Ipecacuanhæ.**—See Morphine, p. 302.

5. **Syrupus Ipecacuanhæ.**—Syrup of Ipecac. Fluid Extract of Ipecac, 75; Acetic Acid, 10; Glycerin, 100; sugar, 700; water to 1000.

Dose, 5 m. to 2 fl. dr.; .30 to 8.00 c.c.

6. **Tinctura Ipecacuanhæ et Opii.**—*See* Opium, p. 300.

7. **Vinum Ipecacuanhæ.**—Wine of Ipecac. Fluid Extract of Ipecac, 100; Alcohol, 100; White Wine, 800.

Dose, 1 to 60 m.; .06 to 4.00 c.c.]

Action.

External.—Ipecacuanha powder is a powerful **irritant** to the skin, producing redness, vesication, and postulation. It has some **antiseptic** powers, for it can destroy anthrax bacilli, but it has no effect on the spores. This property is not due to its emetine, but to some other constituent.

Internal.—*Alimentary canal.*—Here also the irritating action of ipecacuanha is seen. It increases the flow of saliva, dilates the gastric vessels, and stimulates the secretion of gastric juice. Therefore **small doses** are distinctly **stomachic**, and aid digestion. Large doses are, however, powerfully **emetic**. This is partly due to their irritant effect upon the stomach, but still more to the fact that emetine acts directly upon the vomiting centre in the medulla, as can be proved by observing that, when the alkaloid is thrown directly into the circulation, vomiting follows before there is time for it to have been excreted into the stomach. Ipecacuanha is, therefore, both a direct and indirect emetic. It produces a certain amount of depression, but not more than the mere act of vomiting will explain. It does not usually cause nausea. The irritant effect is continued in the intestine, and hyperæmia, excessive secretion, and purging result. In dysentery there is a peculiar tolerance of ipecacuanha. Ipecacuanha increases the amount of bile secreted, and is therefore a direct **cholagogue.**

Circulation.—No specific effect whatever is produced except by enormous doses which may arrest the beat of the heart, but the act of vomiting is somewhat depressing.

Respiration.—This likewise is unaffected. Ipecacuanha powder when inhaled, or taken internally, when it is excreted by the bronchial mucous membrane, causes hyperæmia of it, together with an increased secretion of bronchial mucus, and therefore, reflexly, coughing is stimulated. It is, consequently, an **expectorant**; and because the nausea it produces depresses the circulation a little, it is called a depressant expectorant; but this is a misnomer, considering that the bronchial mucous membrane is stimulated. Animals to which large doses of ipecacuanha or of emetine have been given show, after death, considerable hyperæmia of the bronchial mucous membrane, of the lungs, and of the stomach and intestines, and the same condition of the respiratory passage is seen if ipecacuanha powder has been inhaled.

Skin.—Ipecacuanha is a mild **diaphoretic.**

THERAPEUTICS.

External.—Ipecacuanha is never at the present day employed for its external irritant effect. It has been used with success, as an antiseptic, in cases of anthrax. It is directed that the wound should be dressed with the powder, and that 5 gr. [30. gm.] should be taken by the mouth, every two hours.

Internal.—*Stomach.*—Occasionally in small doses, such as 4 or 5 minims [.25 to .30 c.c.] of the wine or ¼ gr. [.015 gm.] of the powder, it is employed as a stomachic, and these quantities may even stop vomiting when other drugs have failed. A usual prescription to arrest the vomiting of pregnancy is a minim [.06 c.c.] of ipecacuanha wine in water every half hour. The powder of ipecac and opium has been praised in cases of gastric ulcer; no doubt any good effect it may have is due to its stimulating power. Ipecacuanha is a very common emetic. It should not be given when it is desired, as in cases of poisoning, to empty the stomach quickly, for some time elapses before it is absorbed and influences the medulla; nor should it be given to the very feeble, for it has no action that will counteract the depression of the vomiting. But it is an excellent emetic when it is wished, by

the act of vomiting, to empty the air-passages, as in bronchitis, the early stages of diphtheria, tracheitis, and laryngitis, for not only the vomiting, but the effect of ipecacuanha on the respiratory tract and the slight subsequent depression will be beneficial. It is chiefly employed for this purpose in children, as they cannot cough well, and often it seems to act like a charm. It used to be given in the early stage of fevers, to empty the stomach of undigested food. A good emetic powder for an adult consists of 20 gr. [1.20 gm.] of powdered ipecacuanha with ½ gr. [.03 gm.] of tartar emetic.

Ipecacuanha is said to be a specific for dysentery. How it acts is not known. Very large doses must be given—60 to 90 gr. [4. to 6. gm.] in a single dose, or 20 gr. [1.20 gm.] every four hours.

Half a grain to a grain [.03 to .06 gm.] or more is often combined in a pill with other cholagogues to relieve cases of hepatic dyspepsia, and sometimes with excellent results.

Respiration.—Ipecacuanha is a very common expectorant. [The troches] may be [dissolved in the mouth or the syrup], or wine may be given internally. It is suitable in cases of bronchitis or phthisis in which the secretion is scanty, and therefore there is much purposeless cough; and also when the disease is of long standing, for then the stimulation of the chronically inflamed mucous membrane will aid the cure of it. Its power of exciting the act of coughing adds to its usefulness.

The inhalation of ipecacuanha powder by means of an atomizer has been recommended in cases of asthma, and for the asthma-like paroxysms which often accompany chronic bronchitis. Sometimes it does good, but it may make the trouble worse.

Skin.—Dover's powder is very commonly used as a diaphoretic in mild feverish attacks.

[ALLIUM.

GARLIC.—The bulb of *Allium sativum* Linnè (nat. ord. *Liliaceæ*). *Habitat.*—Asia and Southern Europe, cultivated.

CHARACTERS.—Bulb subglobular, compound, consisting of about eight compressed, wedge-shaped bulblets, which are arranged in a circle around the

base of the stem, and covered by several dry, membranous scales. Odor pungent and disagreeable; taste warm and acrid.

COMPOSITION.—The chief constituents are:—(1) A volatile oil, ¼ per cent., which consists of Allyl (C_3H_5) oxide and sulphide. (2) Mucilage. (3) Albumin.

Dose, 15 to 30 gr.; 1. to 2. gm.

Preparation.

Syrupus Allii.—Syrup of Garlic. Garlic, 200; sugar, 800; diluted Acetic Acid to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

ACTION AND USES.

The effects of garlic are those of a general stimulant, quickening the circulation, exciting the nervous system, and promoting expectoration. It is beneficial in impaired digestion, in chronic catarrhal and other pectoral affections in which symptoms of inflammation have subsided and a relaxed state of the vessels remains.]

LOBELIA.

[**LOBELIA.**—The leaves and tops of *Lobelia inflata* Linné (nat. ord. *Lobeliaceæ*), collected after a portion of the capsules have become inflated *Habitat.*—North America, in fields and open woods.

CHARACTERS.—Leaves alternate, petiolate, the upper ones sessile, ovate or oblong, about 5 cm. long, irregularly toothed, pubescent, pale green; branches hairy, terminating in long racemes of small, pale blue flowers, having an adherent five-toothed calyx, which is inflated in fruit, a bilabiate corolla, and five united stamens; odor slight, irritating; taste mild, afterwards burning and acrid.]

COMPOSITION.—The chief constituents are:—(1) *Lobeline*, a white powder, inodorous, fully soluble in water. (2) *Lobelacrin* (probably Lobeline Lobelate). (3) *Lobelic Acid.*

INCOMPATIBLES.—Caustic Alkalies, as they decompose Lobeline.

Dose, 1 to 10 gr.; [.06 to .60 gm.]

Preparations.

[1. **Extractum Lobeliæ Fluidum.**—Fluid Extract of Lobelia. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 1 to 10 m.; .06 to .60 c.c.]

2. **Tinctura Lobeliæ.**—[Tincture of Lobelia. Lobelia, 200. By percolation with diluted Alcohol to 1000.

Dose, 5 to 30 m.; .30 to 2.00 c.c.]

Action.

External.—Lobelia has no effect on the skin, but it is stated that poisonous symptoms may occur from absorption of it through the epidermis.

Internal.—*Gastro-intestinal tract.*—Moderate or large doses are powerfully **irritant,** and thus they cause violent vomiting and purging. A peculiarity of the action of lobelia is that these results are accompanied by very intense **prostration,** as shown by the feeble pulse, cold sweats, pale skin, and great muscular relaxation.

Circulation.—In the frog the heart is at first stimulated, but soon depressed, and it finally stops in diastole. The blood-pressure falls. This is due partly to the action on the heart, and partly to paralysis of the vaso-motor centres.

Respiration. — Small doses slow respiration, large doses strongly depress the respiratory centre, and death takes place from respiratory failure. The muscular coat of the bronchi is said to be **relaxed.**

Nervous system.—Toxic doses are required to affect the higher cerebral centres, and then coma and convulsions are produced, but it is not clear how far these results are due to asphyxia. The respiratory and vaso-motor centres, and probably the cardiac, are, as already mentioned, depressed. Experiments seem to show that the motor centres of the cord are also depressed. Muscles and nerves are unaffected.

Lobeline is probably excreted by the kidneys and skin, and is said to have diuretic and diaphoretic properties.

Therapeutics.

Lobelia has been recommended as a purgative, and as an emetic, but it should not be used for these purposes, because of its great liability to produce collapse. It is employed in asthma to relax the muscular coat of the bronchial tubes. A [drachm; 4 c.c.] of the tincture should be given till nausea is experienced, but it should never be pushed beyond that point. It may also be prescribed for bronchitis accompanied by spasmodic dyspnœa.

[GRINDELIA.

GRINDELIA.—The leaves and flowering tops of *Grindelia robusta* Nuttall, and of *Grindelia Squarrosa* Dunal (nat. ord. *Compositæ*). *Habitat.*—(1) *G. robusta*, North America, west of the Rocky Mountains, in salt marshes. (2) *G. squarrosa*, Western Plains to the Sierra Nevada and south to Texas.

CHARACTERS.—Leaves about 5 cm. or less long, varying from broadly spatulate or oblong to lanceolate, sessile or clasping, obtuse, more or less sharply serrate, often spinosely toothed, or even lacinate-pinnatifid, pale green, smooth-finely dotted, thickish, brittle; heads many-flowered, subglobular or somewhat conical; the involucre hemispherical, about 10 mm. broad, composed of numerous imbricated, squarrosely-tipped or spreading scales; ray florets yellow, ligulate, pistillate; disk-florets yellow, tubular, perfect; pappus consisting of two or three awns of the length of the disk-florets; odor balsamic, taste pungently aromatic and bitter.

COMPOSITION.—The chief constituents are—(1) A volatile oil. (2) A resin, to which its properties are due. (3) A peculiar glucoside, and (4) possibly an alkaloid, *Grindeline*.

Dose, ¼ to 1 dr.; 1. to 4. gm.

Preparation.

Extractum Grindeliæ Fluidum.—Fluid Extract of Grindelia. By maceration and percolation with Alcohol, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.]

ACTION AND THERAPEUTICS.

In small doses, Grindelia is a mild stomachic and cardiac sedative, but its main action depends upon the fact that in its excretion by the bronchial mucous membrane it acts as an expectorant, and also relaxes the muscular coat of the bronchial tubes, and this explains its efficacy in asthma. Two or three doses of twenty minims; [1.20 c.c.] of the fluid extract in milk, which prevents precipitation in the resin, given every twenty minutes, will often allay the paroxysms of asthma. Between the attacks, this dose should be taken three times a day. The same quantity may with advantage be added to mixtures prescribed for chronic bronchitis, for not only is Grindelia an expectorant, but it relieves the asthmatic paroxysms which so frequently accompany bronchitis. It is very bitter; its taste is best concealed by Spiritus Chloroformi. Linen soaked in a lotion of the fluid extract in

water, 1 to 48, is applied to the skin for the dermatitis caused by *Rhus toxicodendron*, the poison ivy. The same lotion is used in burns, and as an injection in gleet and leucorrhæa.

ASCLEPIAS.

[**ASCLEPIAS.**—*Synonym.*—Pleurisy Root. The root of *Asclepias, tuberosa* Linné (nat. ord. *Asclepiadeæ*). *Habitat.*—United States, near the Atlantic Coast.

CHARACTERS.—Root large and fusiform, dried in longitudinal or transverse sections, from 2 to 15 cm. long, and about 2 cm. or more in thickness; the head knotty, and slightly but distinctly annulate, the remainder longitudinally wrinkled, externally orange brown, internally whitish; tough and having an uneven fracture; bark thin, and in two distinct layers, the inner one whitish; wood yellowish, with large, white, medullary rays. It is inodorous, and has a bitterish, somewhat acrid taste.

CONSTITUENTS.—(1) A crystalline Glucoside, soluble in Alcohol, Ether, and somewhat in water. (2) *Asclepion*, a bitter crystalline principle. (3) Two Resins.

Dose, ¼ to 2 dr.; 2. to 8. gm.

Preparation.

Extractum Asclepiadis Fluidum.—Fluid Extract of Asclepias. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

USES.

Pleurisy root possesses diaphoretic, carminative, and expectorant properties, without being stimulant. It is used in the disease which gives its name, and in various pectoral affections.

CASTANEA.

CASTANEA.—*Synonym.*—Chestnut. The leaves of *Castanea dentata* (Marshall) Sudworth (nat. ord. *Cupuliferæ*), collected in September or October, while still green. *Habitat.*—North America, from Ontario south to Florida, and west to Arkansas and Michigan.

CHARACTERS.—From 15 to 25 cm. long, about 5 cm. wide, petiolate, oblong-lanceolate, acuminate, mucronate, feather-veined, sinuate-serrate, smooth; odor slight; taste somewhat astringent.

CONSTITUENTS.—(1) Tannin, about 9 per cent. (2) Albumin. (3) Resin. (4) Gum.

Dose, ½ to 2 dr.; 2. to 8. gm.

Preparation.

Extractum Castaneæ Fluidum.—Fluid Extract of Castanea. By maceration with boiling water, percolation, evaporation, and addition of Glycerin and Alcohol.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

Uses.

Chestnut leaves are mildly sedative, they are used only in whooping-cough, because they are supposed to possess antispasmodic and expectorant properties.

INULA.

INULA.—*Synonym.*—Elecampane. The root of *Inula Helenium* Linné (nat. ord. *Compositæ*). *Habitat.*– Central and Southern Europe, and eastward to central Asia; spontaneously in the United States; cultivated.

Characters.—In transverse, concave slices or longitudinal sections, with overlapping bark, externally wrinkled and brown; flexible in damp weather; when dry, breaking with a short fracture; internally grayish, fleshly, slightly radiate, and dotted with numerous shining, yellowish-brown resin cells; free from starch; odor peculiar, aromatic; taste bitter and pungent.

Composition.—The chief constituents are—(1) *Inulin*, $3C_{12}H_{20}O_{10}+H_2O$, sometimes called *Alantin*, which is found in 19 to 44 per cent., according to the season; (2) Alantic Acid, $C_{15}H_{20}O_2$; (3) *Helenin*, C_6H_8O. (4) A volatile oil, consisting of alantic anhydride, and alantol or alant camphor.

Dose, ¼ to 1 dr.; 1. to 4. gm.

Uses.

It is chiefly used in diseases of the lungs, especially when complicated with general debility. Recently, some laboratory experiments have suggested that helenin may be of value in the treatment of tuberculosis, since it is believed to be a bactericide.

ASPIDOSPERMA.

ASPIDOSPERMA.—*Synonym.*—Quebracho. The bark of *Aspidosperma Quebracho-blanco* Schlechtendal (nat. ord. *Apocynaceæ*). *Habitat*—Argentine Republic.

Characters.—In nearly flat pieces, about 1 to 3 cm. thick; the outer surface yellowish-gray or brownish, deeply fissured; inner surface yellowish-brown or reddish-brown, distinctly striate; fracture displaying two sharply defined strata, of about equal thickness, and both marked with numerous

whitish dots and striæ arranged in tangential lines; the fracture of the outer, lighter colored layer rather coarsely granular, and that of the darker colored, inner layer short-splintery; inodorous; taste very bitter and slightly aromatic.

COMPOSITION.—(1) *Aspidospermine*, $C_{22}H_{28}N_2O_2$, (2) *Quebrachamine*, (3) *Aspidospermatine*, (4) *Aspidosamine*, $C_{22}H_{28}N_2O_2$, (5) *Hydroquebrachine*, $C_{21}H_{28}N_2O_2$, all being Alkaloids, (6) Quebrachit, a peculiar sugar, (7) Tannin.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

Preparation.

Extractum Aspidospermatis Fluidum.—Fluid Extract of Aspidosperma. By maceration with Glycerin and Alcohol, and percolation with Glycerin, Alcohol and water, and evaporation.

Dose, 5 to 30 gr.; .30 to 2.00 c.c.

ACTION.

None of the alkaloids fully represent the drug. In the lower animals large doses of the bark produce motor paralysis, with dyspnœa and finally death from asphyxia. The breathing early becomes slower, but deeper; the blood pressure is not affected until late. Penzoldt believes that the relief of dyspnœa which is obtained clinically, is caused by its increasing the power of the blood to take up oxygen.

THERAPEUTICS.

Quebracho is a bitter which may aid the appetite, and is a valuable remedy when the respiration is embarrassed by emphysema, chronic bronchitis, or chronic pneumonia; even uræmic asthma is benefited by it. It is not of benefit in dyspnœa of cardiac origin. The commercial aspidospermine, which is an impure mixture of all the alkaloids, and therefore represents their combined action, may be given in dose of from ¼ to ½ gr.; .015 to .03 gm.

ERIODICTYON.

ERIODICTYON.—*Synonyms.*—Yerba Santa. Mountain Balm. Consumptive's Weed. The leaves of *Eriodictyon glutinosum* Bentham (nat. ord. *Hydrophyllaceæ*). *Habitat.*—California.

CHARACTERS.—Oblong lanceolate, 5 to 10 cm. long, acute at the apex, and below narrowed into a short petiole, the margin sinuately toothed to nearly entire; upper surface green, smooth, and covered with a brownish resin;

lower surface reticulate and minutely white-tomentose; odor somewhat aromatic; taste balsamic and sweetish.

COMPOSITION.—The chief constituents are: (1) Volatile Oil, (2) Resin, acrid, greenish-yellow containing *Ericolin*, $C_{34}H_{56}O_{21}$, (3) Tannin, 8 per cent.

Dose, 15 to 30 gr.; 1. to 2. gm.

Preparation.

Extractum Eriodictyi Fluidum.—Fluid Extract of Eriodictyon. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 15 to 30 m.; 1. to 2. c.c.

ACTION AND USES.

Eriodictyon has long been used in California as a bitter tonic, and as a stimulating expectorant. It has been found useful in chronic bronchitis. It is an excellent vehicle for quinine, concealing its bitter taste.]

GROUP IV.

Vegetable Drugs having Antiperiodic, Antipyretic, and Antiseptic Properties.

Cinchona, Quinine, Salicin, Salicylic Acid, Gaultheria, Salol, Hydrastis.

CINCHONA.

[**CINCHONA.**—The bark of *Cinchona Calisaya* Weddell, *Cinchona officinalis* Linné, and of hybrids of these and of other species of *Cinchona* (nat. ord. *Rubiaceæ*), yielding, when assayed, not less than 5 per cent. of total alkaloids, and at least 2.5 per cent. of Quinine ($C_{20}H_{24}N_2O_2 + H_2O = 341.3$). *Habitat.*—South America, on the Eastern slope of the central chain of the Andes, thence spreading northward into Colombia; cultivated in Java, India, Jamaica, and other countries; to a limited extent also in South America.

CHARACTERS.—In quills or incurved pieces, varying in length, and usually 2 or 3, or sometimes 5 mm. thick; the outer surface covered with a gray or brownish gray cork, usually slightly wrinked, marked with transverse, and also with intersecting, longitudinal fissures (*C. Calisaya*), and sometimes with scattered warts and slight longitudinal ridges; inner surface light cinnamon-brown, very finely striate; fracture short and granular in the outer layer, and

finely fibrous in the inner layer; powder light brown or yellowish-brown; odor slight, somewhat aromatic]; taste bitter and somewhat astringent.

COMPOSITION.—The chief constituents of Cinchona Bark are several alkaloids, acids, a glucoside, Tannin, a coloring matter and a volatile oil.

(1) *Quinine.*—An Alkaloid, exists as the Hydrate. Gives a green color with Chlorine water and Ammonia; turns the plane of polarization to the left, solutions of its salts are fluorescent. Forms salts with acids. (*See* p. 396.)

(2) *Quinidine.*—An Alkaloid, $C_{20}H_{24}N_2O_2$, isomeric with Quinine, differing from it only in crystallizing in prisms, turning the plane of polarization to the right, and not being soluble in ammonia except in excess.

(3) *Cinchonine.*—An Alkaloid. No green color with Chlorine Water and Ammonia. Turns the plane of polarization to the right. Not fluorescent. (*See* p. 399).

(4) *Cinchonidine.*—An Alkaloid, $C_{19}H_{22}N_2O$, isomeric with Cinchonine, differing from it in turning the plane of polarization to the left, being sparingly soluble in Ether, and being slightly fluorescent.

(5) [*Quinamine.*]—An Alkaloid, $C_{19}H_{24}N_2O_2$. Not important.

(6) *Kinic or Quinic Acid.*—$C_7H_{12}O_6$. Large, colorless prisms. It and its salts are soluble in water, and thus Quinine may be given subcutaneously as Quinine Quinate. The acid is found in the Coffee Bean and other plants. It is allied to Benzoic Acid, and appears in the urine as Hippuric Acid.

(7) *Kinovic or Quinovic Acid,* [$C_{32}H_{48}O_6$.]—A white amorphous substance related to Kinovin.

(8) *Kinovin or Quinovin.*—A Glucoside, [$C_{30}H_{48}O_8$,] which easily decomposes into Glucose and Kinovic Acid.

(9) *Cinchotannic Acid.*—[2 to 4] per cent. It is the astringent principle of Cinchona Bark. It differs from Tannic Acid in becoming green with ferric salts. It is easily oxidized to Cinchona Red.

(10) *Cinchona Red.*—The coloring matter of the bark It is almost insoluble in water.

(11) *A Volatile Oil.*—This exists in minute quantities. Cinchona Bark owes its smell to it.

[The true yellow Cinchona Bark must not be confounded with other Cinchona Barks of a similar color, but having the bast fibres in bundles or raised rows, and breaking with a splintery or coarsely fibrous fracture.]

Remijia Bark yields, in addition, Homoquinine, which is a compound of Quinine and Cupreine, [$C_{19}H_{22}N_2O_2$.]

IMPURITIES.—[Inferior barks, known by their not yielding the full strength of Quinine and Cinchonine.]

INCOMPATIBLES.—Ammonia, lime water, metallic salts and gelatin.

Dose, 10 to 60 gr.; [.60 to 4.00 gm.]

Preparations.

[1. **Infusum Cinchonæ.**—Infusion of Cinchona. Cinchona, 60; Aromatic Sulphuric Acid, 10; by percolation with water to 1000.

Dose, 1 to 2 fl. oz.; 30. to 60. c.c.

2. **Extractum Cinchonæ.**—Extract of Cinchona. By maceration and percolation with Alcohol and water, distillation of the Alcohol and evaporation.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

3. **Extractum Cinchonæ Fluidum**—Fluid Extract of Cinchona. By maceration and percolation with Alcohol, Glycerin and water, and evaporation, addition of Alcohol.

Dose, 10 to 60 m.; .60 to 4.00 c.c.

4. **Tinctura Cinchonæ.**—Tincture of Cinchona. Cinchona, 200; Glycerin, 75. By maceration and percolation with Alcohol and water to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

CINCHONA RUBRA.

[**RED CINCHONA.**—The bark of *Cinchona succirubra* Pavon (nat. ord. *Rubiaceæ*), containing not less than 5 per cent. of its peculiar alkaloids. *Habitat.*—Ecuador, west of Chimborazo.

CHARACTERS.—In quills or incurved pieces, varying in length, and from 2 to 4 or 5 mm. thick; the outer surface covered with a grayish-brown cork, more or less rough from warts and longitudinal warty ridges, and from few, mostly short transverse fissures; inner surface more or less deep reddish-brown and distinctly striate; fracture short-fibrous in the inner layer; powder reddish-brown; odor slight; taste bitter and astringent.

CONSTITUENTS.—*See* Cinchona.

Dose, 10 to 60 gr.; .60 to 4 00 gm.

Preparation.

Tinctura Cinchonæ Composita.—Compound Tincture of Cinchona. Red Cinchona, 100; Bitter Orange Peel, 80; Serpentaria, 20; Glycerin, 75. By maceration and percolation with Alcohol, Glycerin and water to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

[QUININA.

1. **QUININE.**—$C_{20}H_{24}N_2O_2+3H_2O=377.22$. An Alkaloid obtained from the bark of various species of Cinchona (nat. ord. *Rubiaceæ*).

SOURCE.—By adding to a solution of the Sulphate a sufficient quantity of Ammonia Water to precipitate the Alkaloid.

CHARACTERS.—A white, flaky, amorphous or crystalline powder, odorless, and having a very bitter taste; permanent to the air. *Solubility.*—In 1670 parts of water, and in 6 parts of Alcohol; in 23 parts of Ether, 5 parts of Chloroform and 200 parts of Glycerin; also soluble in Carbon Disulphide, Benzin, Benzol, Ammonia Water, and diluted acids.]

IMPURITIES.—Other alkaloids, cinchonine, cinchonidine, quinidine and cupreine. Lime, chalk, magnesia, starch and other white powders. Salicin, detected by its giving a blood-red color with sulphuric acid.

[*Quinine is used to prepare* Ferri et Quininæ Citras and Ferri et Quininæ Citras Solubilis.

Dose, 1 to 20 gr.; .06 to 1.20 gm.]

2. **QUININÆ SULPHAS.**—Quinine Sulphate. $(C_{20}H_{24}N_2O_2)_2H_2SO_4[+ 7H_2O = 870.22$.

SOURCE.—By boiling Cinchona in water acidulated with Hydrochloric Acid and straining. Add lime to the decoction, and wash the precipitate. Digest in boiling Alcohol and distil off the Alcohol. Dissolve the residue in distilled water and Sulphuric Acid, boil with animal charcoal, filter and set aside to crystallize.]

CHARACTERS.—[White, silky, light and fine, needle shaped crystals, fragile and somewhat flexible, making a very light and easily compressible mass, lustreless from superficial efflorescence after being for some time exposed to the air, odorless, and having a persistent, very bitter taste. The salt is liable to lose water on exposure to warm air, to absorb moisture in damp air, and to become colored by exposure to light. *Solubility.*—In 740 parts of water, and in 65 parts of Alcohol; also in 40 parts of glycerin, in about 680 parts of Chloroform, and freely in dilute acids.]

INCOMPATIBLES.—Alkalines and their carbonates, and astringent infusions.

[*Quinine Sulphate is used to prepare* Syrupus Ferri, Quininæ et Strychninæ Phosphatum.

Dose, 1 to 5 gr.; .06 to .30 gm., or 5 to 20 gr.; .30 to 1.20 gm.] (antipyretic and antiperiodic).

3. **[QUININÆ BISULPHAS.**—Quinine Bisulphate.—$C_{20}H_{24}N_2O_2H_2SO_4 + 7H_2O = 546.88$.

SOURCE.—By suspending Quinine Sulphate in water, adding Sulphuric Acid, filtering and crystallizing.

CHARACTERS.—Colorless, transparent or whitish, orthorhombic crystals, or small needles, odorless, and having a very bitter taste. Effloresing on

exposure to air. *Solubility.*—In 10 parts of water, and in 32 parts of Alcohol.

Dose, 1 to 20 gr. ; .06 to 1.20 gm.

4. QUININÆ HYDROBROMAS.—Quinine Hydrobromate. $C_{20}H_{24}N_2O_2HBr + H_2O = 422.06$.

SOURCE.—By suspending Quinine Sulphate in water, adding Barium Bromide in solution, filtering, evaporating, and crystallizing.

CHARACTERS.—White, light, silky needles, odorless, and having a very bitter taste. The salt is liable to lose water on exposure to warm or dry air. *Solubility.*—In 54 parts of water, and in 0.6 part of Alcohol; also soluble in 6 parts of Ether, and in 12 parts of Chloroform.

Dose, 1 to 2 gr. ; .06 to 1.20 gm.

5. QUININÆ VALERIANAS.—Quinine Valerianate. $C_{20}H_{24}N_2O_2C_5H_{10}O_2 + H_2O = 443.07$.

SOURCE.—By decomposing Quinine Sulphate by Ammonia, combining directly with Valerianic Acid, and crystallizing from a cold solution.

CHARACTERS.—White, or nearly white, pearly, lustrous, triclinic crystals, having a slight odor of Valerianic Acid, and a bitter taste. Permanent in the air. *Solubility.*—In 100 parts of water, and in 5 parts of Alcohol.

Dose, 1 to 30 gr. ; .06 to 2.00 gm.]

6. QUININÆ HYDROCHLORAS.—Quinine Hydrochlorate. $C_{20}H_{24}N_2O_2HCl[+ 2H_2O = 395.63$.

SOURCE.—By treating the Alkaloid with diluted Hydrochloric Acid, and crystallization.

CHARACTERS.—White, silky, light and fine, needle-shaped crystals, odorless, and having a very bitter taste. The salt is liable to lose water when exposed to warm air. *Solubility.*—In 34 parts of water, and in 3 parts of Alcohol; also soluble in 9 parts of Chloroform.]

Dose, 1 to 20 gr. ; [.06 to 1.20 gm.]

7. [QUINIDINÆ SULPHAS.—Quinidine Sulphate. $(C_{20}H_{24}N_2O_2)_2H_2SO_4 + 2H_2O = 780.42$. The neutral sulphate of an alkaloid obtained from the bark of several species of Cinchona (nat. ord. *Rubiaceæ*).

SOURCE.—From the mother liquors after the crystallization of Quinine, by the same process as for Quinine.

CHARACTERS.—White, silky needles, odorless, and having a very bitter taste; permanent in the air. *Solubility.*—In 100 parts of water, and in 8 parts of Alcohol; also in 14 parts of Chloroform, and in acidulated water; almost insoluble in Ether.

Dose, 1 to 20 gr. ; .06 to 1.20 gm.

8. **CINCHONINA.**—Cinchonine. $C_{19}H_{22}N_2O = 293.41$.

SOURCE.—By precipitation of the aqueous solution of the sulphate by Ammonia Water.

CHARACTERS.—White lustrous prisms or needles, without odor, at first almost tasteless, but soon developing a bitter after-taste; permanent in the air. *Solubility.*—In 3760 parts of water, and in 116 parts of Alcohol; also soluble in 526 parts of Ether, and in 163 parts of Chloroform.

Dose, 1 to 30 gr.; .06 to 2.00 gm.]

9. **CINCHONINÆ SULPHAS.**—Cinchonine Sulphate. $(C_{19}H_{22}N_2O)_2H_2SO_4 + 2H_2O$ [= 720.56.]

SOURCE.—Obtained from the mother liquors after the crystallization of the Quinine, Quinidine, and Cinchonidine Sulphates by further concentration, precipitating the alkaloids by Caustic Soda, washing with Alcohol till free from other alkaloids, dissolving in Sulphuric Acid, purifying with animal charcoal, and crystallizing.

CHARACTERS.— Hard, [white, lustrous, prismatic crystals, without odor, and having a very bitter taste; permanent in the air. *Solubility.*—In 66 parts of water, and in 10 parts of Alcohol; also soluble in 78 parts of Chloroform, but almost insoluble in Ether.]

Dose, 1 to 30 gr; [.06 to 2.00 gm.]

10. **CINCHONIDINÆ SULPHAS.**—Cinchonidine Sulphate. $(C_{19}H_{22}N_2O)_2H_2SO_4 + 3H_2O$ [= 738.52. The neutral sulphate of an alkaloid obtained from the bark of various species of Cinchona.]

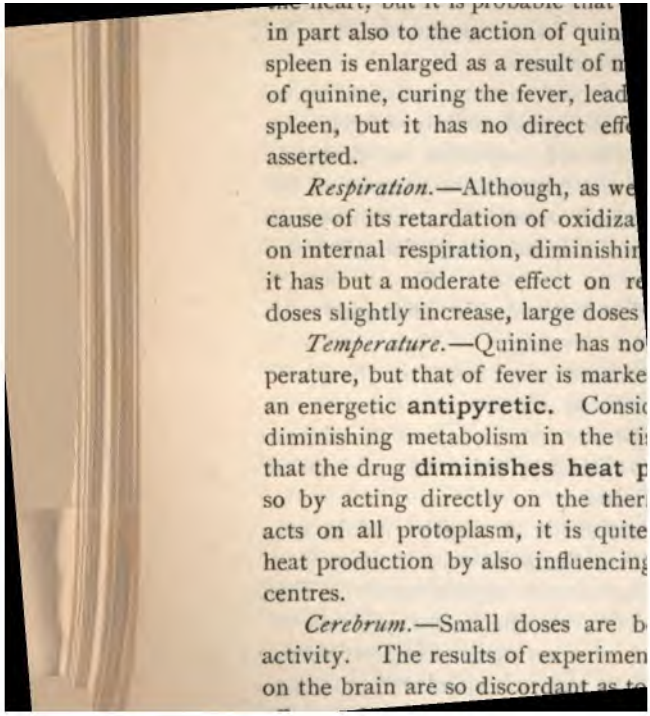
SOURCE.—Obtained from the mother liquors after the crystallization of Quinine Sulphate by further concentration, purifying by crystallization from Alcohol, and finally from hot water.

CHARACTERS.—[White, silky, acicular crystals, without odor, and having a very bitter taste; slightly efflorescent on exposure to air. *Solubility.*—In 70 parts of water, and in 66 parts of Alcohol; also soluble in 1316 parts of Chloroform, and almost insoluble in Ether. The presence of sulphates of other Cinchona Alkaloids increase its solubility in Ether and Chloroform.]

Dose, 1 to 30 gr.; [.06 to 2.00 gm.]

ACTION OF CINCHONA BARK AND ITS ALKALOIDS.

The action of cinchona bark is due almost entirely to the **quinine** in it; the other alkaloids act in much the same way as this alkaloid, the sulphate, [bisulphate, hydrobromate] and hydrochlorate of which produce the same effect as quinine itself. The following description will be that of the action of quinine sulphate,



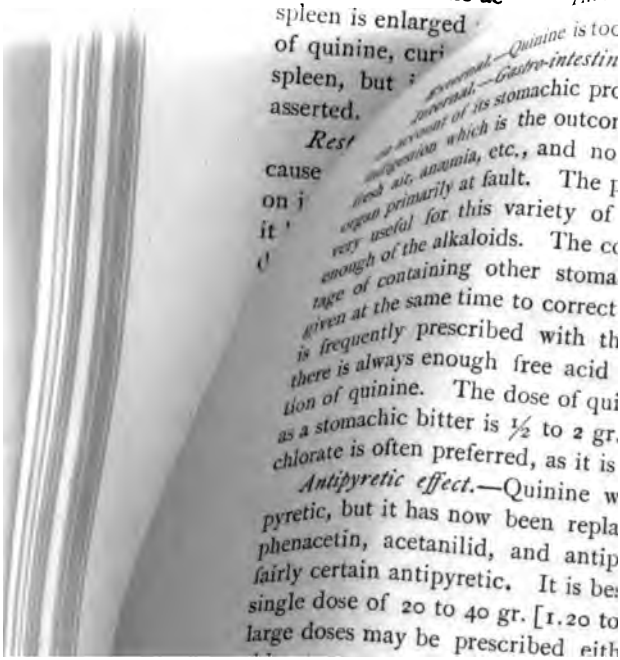
endings. The muscles are uninfluenced. These effects are not seen in man.

Uterus.—It has often been stated that quinine will lead to abortion, that it will, when labor has commenced, aid the expulsion of the fœtus, and that it will increase the menstrual flow if that is scanty. It appears that the first statement is certainly incorrect, and that the second and third are only correct for some women.

Kidneys.—After a full dose of quinine it is found in the urine in half an hour, and is slowly excreted for several days, but by far the greater part is eliminated within the first forty-eight hours. The excretion of uric acid is greatly diminished, and that of urea and other n trogenous bodies in the urine is also considerably lessened. This confirms the statement already made that quinine retards considerably the metabolism of the body, but it should be stated that very little alteration is observed in the excretion of carbonic dioxide by the lungs. It is said that minute quantities of quinine are gotten rid of by all the secretions, as it may be detected in milk, saliva, bile, tears, etc., and it may be found in dropsical fluids if the patient has been taking it.

Cinchonism.—In many persons a dose of ten grains; [.60 gm.] or more of quinine produces a train of physiological symptoms, chiefly from its influence on the nervous system. The patient soon complains of ringing in the ears, fullness in the head, and slight deafness. With larger doses these symptoms increase, disturbances of vision and giddiness are added, he may stagger when he walks, and the headache may be very intense.

Quinine is hardly ever given as a poison, but if it should be, all these symptoms of cinchonism will be very severe; the patient may be delirious and comatose, quite deaf and blind, and if he die it will be from collapse due to cardiac and respiratory failure. Great congestion of the middle ear and labyrinth is found in animals poisoned by quinine. The mild degrees of cinchonism pass off directly [after] the drug is discontinued. Rarely quinine causes an erythematous rash, and it has been known to give rise



puscles that have already passed out wander further from their capillaries. If the quinine be applied locally to the mesentery, directly the white corpuscles have passed through their capillaries their movement is stopped, and the motionless corpuscles collect in large numbers around the capillaries. It is clear, therefore, that quinine has the power of **arresting the movements of white blood-corpuscles.** In sufficient quantity it appears actually to destroy them, for in a cat killed by quinine they are much fewer in number than in a healthy cat.

(*b*) *Red corpuscles.*—Quinine is said to cause a diminution in the size of these, but this is most likely not strictly correct. In fever if the temperature is high, the red corpuscles are probably a little smaller than natural. If the temperature be reduced by any means the corpuscles regain their normal size. Quinine will reduce the temperature, but it probably has no special action on the corpuscles.

(*c*) *Acidity of the blood.*—Blood outside the body gradually becomes acid. Quinine prevents this.

(*d*) *Ozonizing power.*—If ozonized oil of turpentine be mixed with a tincture of guaiacum, nothing occurs; but if a drop of blood be added, that transfers the ozone to the guaiacum, oxidizes it, and turns it blue. This **ozonizing power** of blood is **prevented** by the addition of quinine.

(*e*) *The stability of oxyhæmoglobin* is **strengthened** by quinine, so that the blood does not yield up its oxygen as easily as normally, consequently its cannot absorb oxygen readily. This inability of hæmoglobin to take up oxygen in the presence of quinine is parallel with its action on other varieties of protoplasm. For example, fungi absorb oxygen slowly if quinine be present, and thus fermentation may be prevented. Phosphorescent infusoria (the phosphorescence is due to rapid oxidation) lose this property in the presence of quinine. The ozonizing power of fresh vegetable juices is retarded by it. Quinine is, therefore, very constant and very powerful in interfering with oxidation.

Circulation. - Small doses of quinine probably increase the activity of the heart reflexly because they stimulate the stomach;

... Extractive a proof spirit tin
Socotrine Aloes, 100; Opium, 1; Rhul
Elecampane, Saffron, Fennel, Gentian
as aromatics, with menstruum to 4000
It is often prescribed to be made withou

SALICI

SALICIN.—$C_{13}H_{18}O_7$ [= 285.33.
several species of *Salix* and *Populus* (nat.
naturalized in North America; cultivatec

SOURCE.—(1) Make a strong decocti
tannin by warming and agitating the decoc
rate the solution. Salicin crystallizes out,
and crystallization.

CHARACTERS.—Colorless, [or white, s
a crystalline powder, odorless, and having
the air. *Solubility.*—In 28 parts of water,
insoluble in Ether or Chloroform.]

Dose, 5 to 30 gr.; [.30 to 2.00 gm.

ACIDUM SALIC

SALICYLIC ACID.—$HC_7H_5O_3$ [=
naturally, in combination, in various plants
Betulæ Volatile; but most largely prepared

SOURCE.—Made by combining Carbol
Thus dry Carbon Dioxide is passed throug
F. [220° C. ...

INCOMPATIBLE.—Spirit of Nitrous Ether.

IMPURITIES.—Orthocreosotic and metacreosotic acids, only in artificial salicylic acid.

Dose, 5 to 60 gr.; [.30 to 4.00 gm.]

SODII SALICYLAS.—Sodium Salicylate. $NaC_7H_5O_3$ [= 159.67.]

SOURCE.—Obtained by acting on Sodium Carbonate with Salicylic Acid. [$2HC_7H_5O_3 + Na_2CO_3 = 2NaC_7H_5O_3 + H_2O + CO_2$. The solution may be strained through muslin and heated to expel the Carbon Dioxide.]

CHARACTERS.—[A white, amorphous powder, odorless, and having a sweetish, saline taste. Permanent in cool air. *Solubility.*—In 0.9 part of water, and in 6 parts of Alcohol; also soluble in Glycerin.]

IMPURITIES.—Orthocreosotic and metacreosotic acids.

Dose, 5 to 60 gr.; [.30 to 4.00 gm.]

[LITHII SALICYLAS.—Lithium Salicylate. ($LiC_7H_5O_3$ = 143.68.)

SOURCE.—Obtained by heating Salicylic Acid, Lithium Carbonate, and water, until effervescence ceases, filtering and evaporting. $Li_2CO_3 + 2HC_7H_5O_3 = 2LiC_7H_5O_3 + H_2O + CO_2$.

CHARACTERS.—A white, or grayish-white powder, odorless, and having a sweetish taste; deliquescent on exposure to air. *Solubility.*—Very soluble in water and in Alcohol.

Dose, 1 to 15 gr.; .06 to 1.00 gm.]

ACTION OF SALICIN, SALICYLIC ACID AND OF SODIUM AND [LITHIUM] SALICYLATES.

External.—Salicin and salicylic acid are **antiseptics** rather more powerful than carbolic acid. They are stimulant and mildly irritant to the skin. Locally applied, they **check sweating.** The **salts of salicylic acid** are **not antiseptic.**

Internal.—*Alimentary tract.*—When inhaled or applied to the throat, salicylic acid is irritating, causing sneezing and cough. In the stomach also it is irritant, giving rise to pain, nausea, and vomiting unless well diluted. The sodium [and lithium] salts and salicin are much less irritating. The glucoside, salicin, is in the bowel converted into glucose and saligenin ($C_7H_8O_2$), and this is further decomposed into salicylic acid, salicyluric acid ($HC_9H_8NO_4$), and salicylous acid ($HC_7H_5O_2$).

Blood.—Salicylic acid, whether taken directly or formed in the bowel from the decomposition of salicin, is rapidly absorbed

salicylic acid is set free. Some of the sa
salt unites with glycocoll, forming salicy
in the urine. Thus: $HC_7H_5O_3 + C_2H$
H_5NO_4 (salicyluric acid) $+ H_2O$. It w
change is precisely analogous to the cor
hippuric acid by its union with glycocoll

Heart.—Salicin and salicylic acid are
the force of the heart and cause a fall of
comparison shows that salicin is not nea
acid—in fact it is probable that it has not
given in toxic doses. Further, natural s
depressant as the artificial variety. For ex
that 30 gr. [2. gm.] of salicin, or 10 g
salicylic acid, or 32 gr. [2.12 gm.] of na
had no injurious effect on a rabbit, but th
than these of the artificial acid or its salt
artificial variety was found to contain ort
creosotic acids, and these are powerful c
Thus it seems probable that the depres
ascribed to salicylic acid are really due t
artificial form.

Respiration.—Moderate doses have

Salicylic acid and salicin are **antiperiodic.**

Nervous system.—We know little of the effect of salicylic acid on the individual parts of the nervous system. The clinical symptoms known as salicylism will be described presently.

Kidney.—Salicylic acid escapes chiefly through the kidneys. It has been stated also to leave the body by the sweat, the saliva, the bronchial secretions, and the fæces. It appears in the urine very soon after its ingestion (in from 10 to 30 minutes), but the elimination goes on slowly. It is excreted as salicyluric acid and sodium salicylate, which is split up by the phosphoric acid in the urine, yielding salicylic acid. The dark greenish color of the urine sometimes seen is due to small quantities of either indican or pyrocatechin. Occasionally salicylic acid causes hæmaturia, due to congestion of the kidneys. Probably it increases the nitrogenous elimination. It renders the urine aseptic, and the salicyluric acid in that fluid will reduce Fehling's solution. The urine of patients taking it gives a **purple color** with [**ferric**] **chloride.**

Salicylism.—In about 60 per cent. of the persons to whom salicylic acid or its salt is given a train of symptoms is produced to which the above name has been applied. They are very like those produced by quinine. It is probable that the cause of them is the impurities existing in artificial salicylic acid, but it is stated that the natural acid may give rise to them. The commonest is deafness, which is often accompanied by ringing in the ears; [these symptoms may be relieved by the administration of a small amount of alcoholic stimulant fifteen minutes before each dose.] Headache is also very frequent. The administration of the drug is usually stopped when these symptoms show themselves, but if it is continued the patient becomes violently delirious, there is nausea and vomiting, the face is flushed, and the other symptoms increase in severity. The pulse falls in both frequency and force, it becomes irregular, epistaxis is common, and hæmorrhages from other parts of the body have been recorded, such as hæmaturia and retinal hæmorrhages. Albuminuria without hæmaturia has been observed. One of the rarest symptoms is

erythema or urticaria. All this while the breathing has been becoming weaker, and death may take place either from cessation of the heart or the respiratory movements.

Therapeutics.

External.—The ointment [official in B. P., 1 part of the acid to 9 of lard ... vaselin] may be used when an antiseptic stimulant ... required. A collodion composed of salicylic a... collodion, 8; a glycerin containing 10 per cent ...; and a plaster, also 10 per cent., are good prep... applications of salicylic acid are very useful for ... epidermis, warts, or corns. Powdered salicylic ... starch or chalk may be employed to check per... ion of the feet and axillæ. The German Pharmacop... this purpose a Pulvis Salicylicus cum Talco (salicylic ... wheaten starch, 10; talc, in powder, 87). The sweats of phthisis may be treated in the same way. A little salicylic acid is often added to Thompson's fluid (see p. 247).

Internal.—Salicylic acid is a specific for many cases of rheumatic fever: it lowers the temperature, lessens the swelling, leads to a rapid cessation of pain, and [may] diminish the liability to pericarditis and other complications. It must be given well diluted to prevent dyspepsia. The sodium salt is often preferred as being the most soluble, but in order to diminish the risk of salicylism it should be prepared from natural salicylic acid. If the attack is severe, 20 gr. [1.20 gm.] every two or three hours should be given for the first twelve or twenty-four hours; then, if the patient is doing well, the frequency of the dose may be gradually diminished, but it should be continued thrice daily for ten days after the temperature is normal and the pain has ceased. Salicin is not so powerful as sodium salicylate, but it is said to be less depressant than the synthetic acid.

These preparations are of no use for gout or osteo-arthritis. Salicylic acid or salicin may produce a fall of temperature in any fever, but, as we have more certain antipyretics, they are not

used except for rheumatic fever. Some writers have found salicylic acid useful in migraine, sciatica, diabetes, and diphtheria, but it is probably of little value for these disorders. It has been given to render the urine acid in cases of alkaline urine and cystitis, but there are better remedies for this purpose.

[OLEUM BETULÆ VOLATILE.

VOLATILE OIL OF BETULA.—*Synonym.*—Oil of Sweet Birch. A volatile oil obtained by distillation from the bark of *Betula lenta* Linné (Sweet Birch; nat. ord. *Betulaceæ*). *Habitat.*—Northern United States. It is identical with Methyl Salicylate ($CH_3C_7H_5O_3 = 151.64$), and nearly identical with Oil of Gaultheria.

CHARACTERS.—It has the same properties and conforms to the same reactions and tests as Methyl Salicylate (*see* Methyl Salicylas; also Oleum Gaultheriæ).

Dose, 1 to 5 m.; .06 to .30 c.c.

OLEUM GAULTHERIÆ.

OIL OF GAULTHERIA.—*Synonym.*—Oil of Wintergreen. A volatile oil distilled from the leaves of *Gaultheria procumbens* Linné (Wintergreen; nat. ord. *Ericaceæ*), consisting almost entirely of Methyl Salicylate ($CH_3C_7H_5O_3 = 151.64$) and nearly identical with Volatile Oil of Betula. *Habitat.*—North America, west to Minnesota, and south to Georgia.

CHARACTERS.—A colorless or yellow, or occasionally reddish liquid, having a characteristic, strongly aromatic odor, and a sweetish, warm and aromatic taste. Sp. gr.: 1.175 to 1.185. Boiling point: 218° to 221° C. (424.4° F. to 429.8° F.). It deviates polarized light slightly to the left. In other respects it has the same properties and conforms to the same reactions and tests as Methyl Salicylate (*see* Methyl Salicylas; also Oleum Betulæ Volatile).

Dose, 1 to 5 m.; .06 to 30 c.c.

Preparation.

Spiritus Gaultheriæ.—Spirit of Gaultheria. Oil of Gaultheria, 50; Alcohol, 950.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

METHYL SALICYLAS.

METHYL SALICYLATE.—$CH_3C_7H_5O_3 = 151.64$. *Synonym.*—Artificial (or Synthetic) Oil of Wintergreen. Methyl Salicylate, produced synthetically by distilling Salicylic Acid, or a salicylate, with Methyl Alcohol and strong Sulphuric Acid.

CHARACTERS.—A colorless or slightly yellowish liquid, having the char-

acteristic, strongly aromatic odor and the sweetish, warm and aromatic taste of the Oil of Gaultheria, with the essential constituent of which it is identical. It is wholly identical with Volatile Oil of Betula (*see* Oleum Betulæ Volatile). Sp. gr : 1.183–1.185. Boiling point: 219°–221° C. (426.2°–429.8° F.) It is optically inactive. *Solubility.*—In all proportions in Alcohol, Glacial Acetic Acid, or Carbon Disulphide.

Dose, 1 to 5 m.; .06 to .30 c.c.

Uses.

The action of th... the same as of salicylic acid. When taken in moder...s, they are, like that acid, broken up and eliminat...ric acid. It is asserted that methyl salicylate can be p...f more uniform quality and is more certain and definite ...tion than either of the natural oils. The uses of these ... the same as of salicylic acid, and they possess the additiona...ntage that they are not liable to contamination with impuritie...tho- and metacreosotic acids) which are powerful cardiac depressants and which are found in the artificial salicylic acid.]

SALOL.

SALOL.—[$C_6H_5C_7H_5O_3 = 213.49$. *Synonym.*—Phenyl Salicylate. The Salicylic Ether of Phenol.

SOURCE.—By heating Salicylic Acid with Phenol in the presence of Phosphorus Pentachloride; this action dehydrates and withdraws the elements of water, and unites the Phenyl group with the Salicylic Acid radical.

CHARACTERS.—A white, crystalline powder, odorless, or having a faintly aromatic odor, and almost tasteless. Permanent in the air. *Solubility.*—Almost insoluble in water; soluble in 10 parts of Alcohol; also soluble in 0.3 part of Ether, and readily in Chloroform, and in fixed or volatile oils.

Dose, 5 to 30 gr.; .30 to 2.00 gm.]

ACTION AND THERAPEUTICS.

In the body, [presumably in the small intestines,] salol splits up into [phenol (about 36,) and salicylic acid (64 per cent.),] and the former renders the urine dark. In rheumatic fever it is efficacious on account of the salicylic acid it contains, [although somewhat slower in action, but it has no advantage over salicin or salicylic acid,] and the carboluria may be troublesome.

[It is an antiseptic, and since this decomposition takes place in the alkaline fluid, it has been used as an intestinal antiseptic in acute diarrhœa, dysentery, cholera and other diseases; also in affections of the bladder and urethra. It is a remedy of very great value in the treatment of typhoid fever, for by the active disinfection of the contents of the intestine and of the ulcerations, it favors their healing and prevents reinfection, thus lowering temperature, diminishing the liability to relapse and to permanent damage to tissues. It is the logical treatment, because it destroys the cause of the symptoms, at their point of origin On account of the large proportion of phenol which it contains it is more dangerous than the corresponding amount of salicylic acid, and it is especially to be used with great caution if the kidneys are diseased.]

HYDRASTIS.

HYDRASTIS.—[*Synonyms.*—Golden Seal. Yellow Puccoon. The rhizome and roots of *Hydrastis canadensis* Linné (nat. ord. *Ranunculaceæ*). *Habitat.*—North America, west to Missouri and Arkansas, in woodlands.

CHARACTERS.—Rhizome about 4 cm. long and 6 mm. thick; oblique with short branches, somewhat annulate and longitudinally wrinkled; externally brownish-gray; fracture short, waxy, bright reddish-yellow, with a thickish bark, about ten narrow wood-wedges, broad medullary rays, and large pith. Roots thin, brittle, with a thick, yellow bark and subquadrangular, woody centre. Odor slight; taste bitter.]

COMPOSITION.—It contains—(1) *Berberine*, [$C_{20}H_{17}NO_4$, an alkaloid existing as yellowish prismatic crystals, and is found in many plants (Berberis, Calumba, Coptis, Menispermum, Xanthorrhiza, Xanthoxylum, etc.), chiefly in the orders *Berberaceæ*, *Menispermaceæ*, and *Ranunculaceæ*. It is identical with Buxine, the alkaloid of *Buxus sempervirens*, and Pelosine, that of *Chondodendron tormentosum* (Pareira). (2) *Hydrastine*, $C_{21}H_{21}NO_6$, a colorless alkaloid, soluble in Alcohol and Ether. (3) *Canadine*, $C_{21}H_{21}NO_4$, in white needles.

Dose, 5 to 60 gr.; [.30 to 4.00 gm.]

Preparations.

1. **Extractum Hydrastis [Fluidum.**—Fluid Extract of Hydrastis. By maceration and percolation with Alcohol, Glycerin and water, and evaporation.]

Dose, 5 to 60 m.; [.30 to 4.00 c.c.]

2. Tinctura Hydrastis.—[Tincture of Hydrastis. Hydrast
by maceration and percolation with diluted Alcohol to 1000.
Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

3. Glycerinum Hydrastis.—Glycerite of Hydrastis. Hydrast
by percolation and maceration with Alcohol, distil off the Alcohol, ad
water, filter, and to the filtrate add an equal volume of Glycerin.
Dose, 5 to 60 m.; .30 to 4.00 c.c.

HYDRASTI CHLORAS.—Hydrastinine Hydro
Chlorate. $C_{21}H_{21}NO_6$ The hydrochlorate of an artificial alka
loid derived from H being obtained from Hydrastis.
Source.—By a e by oxidizing agents, as when Man
ganese Dioxide and re used together, or when Platini
Chloride are employed
Characters.— hous granules, or a pale yellow, cry
talline powder, odorless, bitter, saline taste; deliquescent o
exposure to damp air. 0.3 part of water, and in 3 parts o
Alcohol; with difficulty so or Chloroform.
Dose, ⅓ to ½ gr.; .0 .]

ACTION.

The chief alkaloid is berberine which, in moderate doses, acts as a gastric bitter, promoting the appetite, stimulating the gastric secretions, and peristalsis. Hydrastis increases the flow of bile and urine. It will contract the unstriped muscles of arteries and the uterus, and it is therefore hæmostatic. It is mildly anti-periodic. In poisonous doses it stops the heart, causing a great fall of blood-pressure.

THERAPEUTICS.

External.—Hydrastis is employed empirically as a local stimulating application in chronic inflammations, such as unhealthy ulcers. It is used also as a lotion in hyperidrosis, acne, and seborrhœa.

Internal.—The chief use of hydrastis is that it is empirically administered for chronic inflammations of mucous membranes. It is said to be especially valuable for uterine affections, in the chronic gastritis of drunkenness, and to a rather less degree in other forms of chronic gastro-intestinal catarrh. As an injection

or lotion it is employed (either preparation diluted with an equal part of water) for chronic nasal catarrh, otorrhœa, leucorrhœa, gonorrhœa, and as a mouth wash in aphthous stomatitis, chronic pharyngitis, etc. [The fluid extract] has been given to stop uterine hæmorrhage, [with great success. From hydrastine by oxidation, hydrastinine hydrochlorate has been made, which is an excellent remedy for menorrhagia and metrorrhagia and which is likely to have an extensive use.] As an antiperiodic. hydrastis is far inferior to quinine.

GROUP V.

Vegetable Purgatives.

CLASS I.—Laxatives.

Prune, Fig, Tamarind, Cassia Fistula, Manna, Phytolacca, Eupatorium, Castor Oil (small doses).

CLASS II.—Simple purgatives.

Castor Oil, Rhubarb, Juglans, Senna, Frangula, Rhamnus Purshiana, Aloes.

CLASS III.—Drastic purgatives.

Scammony, Jalap, Bryonia, Croton Oil, Colocynth, Elaterium, Gamboge.

CLASS IV.—Cholagogues.

Podophyllum, Leptandra, Chelidonium, Iris, Euonymus.

CLASS I.

PRUNUM.

PRUNE.—The [fruit of *Prunus domestica* Linné (nat. ord. *Rosaceæ*). *Habitat.*—Western Asia; cultivated in many varieties.

CHARACTERS.—Oblong or subglobular, about 3 cm. long, shrivelled, blackish-blue, glaucous; the sarcocarp brownish-yellow; sweet and acidulous; putamen hard, smooth, or irregularly ridged; the seed almond-like in shape, but smaller, and of a bitter-almond taste.]

COMPOSITION.—The chief constituents are—(1) Sugar, [12 to 25 per cent.] (2) Malic Acid, and (3) a purgative principle.

Prunes are contained in Confectio Sennæ.

Dose, they can be administered freely.

ACTION AND THERAPEUTICS.

Prunes are nutritive and slightly laxative. They may be eaten as articles of diet in cases of slight constipation. [They are used as a corrective for senna in the decoction and confection.]

FICUS.

FIG.—The [fleshy receptacle of *Ficus Carica* Linné (nat. ord. *Urticaceæ*), bearing fruit upon its inner surface. *Habitat.*—Western Asia; cultivated in subtropical countries.

CHARACTERS.—Compressed, of irregular shape, fleshy, brownish or yellowish, covered with an efflorescence of sugar; of a sweet, fruity odor, and a very sweet, mucilaginous taste. When softened in water, Figs are pear-shaped, with a scar or short stalk at the base, and a small, scaly orifice at the apex; hollow internally; the inner surface covered with numerous yellowish, hard achenes.]

COMPOSITION.—The chief constituents are—(1) Sugar, 62 per cent; (2) Gum; (3) Fat and Salts.

Figs are contained in Confectio Sennæ.

Dose, they can be administered freely.

ACTION AND THERAPEUTICS.

Figs are a pleasant food and mildly purgative, forming a convenient remedy for slight constipation.

TAMARINDUS.

TAMARIND.—The [preserved pulp of the fruit of *Tamarindus indica* Linné (nat. ord. *Leguminosæ*). *Habitat.*—India and tropical Africa; naturalized in the West Indies.

CHARACTERS.—A reddish-brown, sweet, subacid, pulpy mass, containing strong, somewhat branching fibres, and polished, brown, flattish-quadrangular seeds, each enclosed in a tough membrane; taste sweet and refreshingly acidulous.]

IMPURITY.—Copper.

COMPOSITION.—(1) Tartaric, [Citric, Malic and Acetic Acids; (2) Sugar; (3) Pectin; (4) Tannin and (5) Potassium compounds.]

Tamarind is contained in Confectio Sennæ.

Dose.—It can be administered freely.

ACTION AND THERAPEUTICS.

Tamarind is pleasant and acid to the taste, and a mild laxative. It may be made into tamarind whey (1 part of tamarind

to 30 of milk) and given as an acid, cooling, slightly purgative drink in fevers. It is a good purgative for children, and may be spread on bread and butter.

CASSIA FISTULA.

CASSIA [FISTULA.—*Synonym.*—Purging Cassia. The fruit of *Cassia Fistula* Linné (nat. ord. *Leguminosæ*). *Habitat.*—East India; naturalized in tropical Africa and America.

CHARACTERS.—Cylindrical, 40 to 60 cm. long, nearly 25 mm. in diameter, blackish-brown, somewhat veined, the sutures smooth, forming two longitudinal bands; indehiscent, internally divided transversely into numerous cells, each containing a reddish-brown, glossy, flattish-ovate seed imbedded in a blackish-brown, sweet pulp; odor resembling that of Prunes.]

COMPOSITION.—The chief constituents are—(1) A purgative principle. *Cathartic Acid*, a Glucoside. (*See* Senna, p. 425) [(2) *Sennapicrin*, a Glucoside, $C_{34}H_{56}O_{17}$.] (3) Sugar, 60 per cent. (4) [Pectin. (5) Calcium Oxalate.]

Cassia Fistula is contained in Confectio Sennæ.

Dose, 1 to 8 dr.; [4. to 30. gm.]

ACTION AND THERAPEUTICS.

[The pulp is administered as] a laxative, given only in confection of senna.

MANNA.

MANNA.—The concrete, saccharine exudation [of *Fraxinus Ornus* Linné (nat. ord. *Oleaceæ*.) *Habitat.*—Basin of the Mediterranean.

CHARACTERS.—In flattish, somewhat three-edged pieces, occasionally 20 cm. long, and 5 cm. broad, usually smaller; friable; externally yellowish-white, internally white, porous and crystalline; or in fragments of different sizes, brownish-white and somewhat glutinous on the surface, internally white and crystalline; odor honey-like; taste sweet, slightly bitter and faintly acrid.]

COMPOSITION.—The chief constituents are—(1) Mannit, $[C_6H_8O_6(OH)_6$, 90 per cent. (2) Glucose. (3) *Fraxin*, $C_{32}H_{36}O_{20}$. (4) Mucilage. (5) Resin.]

Manna is contained in Infusum Sennæ Compositum.

Dose, ½ to 2 oz.; [15. to 60. gm.]

ACTION AND THERAPEUTICS.

Manna is given as a mild laxative to children. It dissolves easily in milk, and is pleasant to the taste.

[PHYTOLACCA.

PHYTOLACCÆ FRUCTUS.—Phytolacca Fruit. *Synonym.*—Poke Berry. The fruit of *Phytolacca decandra* Linné (nat. ord. *Phytolaccaceæ.*) *Habitat.*—North America; naturalized in Europe.

CHARACTERS.—A depressed globular, dark purple compound berry, about 8 mm. in diameter, composed of ten carpels, each containing one lenticular, black seed; juice purplish-red; inodorous; taste sweet, slightly acrid.

CONSTITUENTS.—(1) *Phytolaccin.* (2) *Phytolaccic Acid.* (3) Sugar. (4) Gum.

Dose, 5 to 30 gr.; 30. to 2.00 gm.

PHYTOLACCÆ RADIX.—Phytolacca Root. *Synonym.*—Poke Root. The root of *Phytolacca decandra* Linné (nat. ord. *Phytolaccaceæ.*)

CHARACTERS.—Large, conical, branched and fleshy; mostly in transverse or longitudinal slices, wrinkled, grayish, hard; fracture fibrous, the wood-bundles in several distinct, concentric circles; inodorous; taste sweetish and acrid.

CONSTITUENTS.—(1) Resin. (2) Probably a Glucoside. (3) A volatile acid.

Dose, 5 to 30 gr.; .30 to 2.00 gm. (emetic); **1 to 5 gr.; .06 to .30 gm.** (alterative).

Preparation.

Extractum Phytolaccæ Radicis Fluidum.—Fluid Extract of Phytolacca Root. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

USES.

Phytolacca is used as an emetic and purgative, and it possesses also some narcotic properties. Recently a preparation made from the berries has been used to reduce adipose tissue.

EUPATORIUM.

EUPATORIUM.—*Synonym.*—Thoroughwort. Boneset. The leaves and flowering tops of *Eupatorium perfoliatum*, Linné (nat. ord. *Compositæ.*) *Habitat.*—North America, west to Dakota; in low grounds.

CHARACTERS.—Leaves opposite, united at the base, lanceolate, from 10 to 15 cm. long, tapering, crenately serrate, rugosely veined, rough above, downy and resinous dotted beneath; flower heads corymbed, numerous, with an oblong involucre of lance-linear scales, and with from ten to fifteen white

florets, having a bristly pappus in a single row; odor weak and aromatic; taste astringent and bitter.

COMPOSITION.—Its principal constituents are—(1) *Eupatorin*, a bitter glucoside. (2) Volatile Oil. (3) Resin.

Dose, ¼ to 1 dr.; 1. to 4. gm.

Preparation.

Extractum Eupatorii Fluidum.—Fluid Extract of Eupatorium. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

ACTION AND USES.

Thoroughwort is tonic, diaphoretic (in infusion), and aperient. It is a domestic remedy for the commencement of a catarrh, influenza, or muscular rheumatism.]

CLASS II.

OLEUM RICINI.

CASTOR OIL.—[A fixed oil expressed from the seed of *Ricinus communis* Linné (nat. ord. *Euphorbiaceæ*). *Habitat.*—India; cultivated.

CHARACTERS.—A pale yellowish or almost colorless, transparent, viscid liquid, having a faint, mild odor, and a bland, afterwards slightly acrid, and generally offensive taste. Sp. gr., 0.950 to 0.970. *Solubility.*—In an equal volume of Alcohol, and, in all proportions, in absolute Alcohol, or in glacial Acetic Acid; also soluble in 3 times its volume of a mixture of 19 volumes of Alcohol and 1 volume of water (absence of more than about 5 per cent. of *most other fixed oils*).

COMPOSITION.—The chief constituents are—(1) *Ricinolein*, $C_3H_5(C_{18}H_{34}O_3)_3$, which is the Ricinoleic Acid, $C_{18}H_{34}O_3$, Glyceride.] This constitutes the chief bulk. (2) Other fixed oils, as palmitin, stearin, and myristin. (3) An acrid principle.

[*Castor oil is contained in* Collodium Flexile, Linimentum Sinapis Compositum, Pilulæ Antimonii Compositæ and Unguentum Hydrargyri Oxidi Rubri.

Dose, ¼ to 2 fl. oz.; 8. to 60. c.c.]

Castor oil seeds are not official, but it is important to recognize them. They are [17 mm.] long and [8 mm.] wide, ovoid, flattened. The seed is prolonged into a sharp beak. Epidermis shiny gray, marked by brownish bands and spots. Kernel white. They contain 50 per cent. of the oil, and an acrid substance which makes them poisonous. Three Castor oil seeds have been known to kill an adult man.

Action.

External.—Castor oil is, like olive oil, protective and sedative, and may be used to drop into the eye when the conjunctiva is inflamed, and as a solvent for homatropine, but this solution is occasionally a little irritating.

Internal.—*Gastro-intestinal tract.*—The so-called [unpleasant] taste of castor oil is mostly due to the smell, and is not noticed much if the nose is held when the oil is drunk. Medicinal doses produce no effect on the stomach. Reaching the intestine the oil is an excellent **simple laxative** or mild purgative, acting in about five hours, and causing no griping nor subsequent constipation. The motion is soft, but not liquid. Castor oil will purge even when rubbed into the skin. How it acts is unknown. It has been thought that the [ricinolein (ricinoleic acid glyceride)] in the oil is decomposed in the duodenum, and the ricinoleic acid purges, but this is probably incorrect. The most likely view is that the oil contains some purgative principle which has not yet been isolated. Probably the seeds contain much more of this than the oil, for they are ten times more purgative, a fact which it is impossible to explain if it is the ricinoleic acid which purges. Castor oil will purge when given *per rectum*.

Mammary glands.—[The leaves] applied locally to the breasts are said to be **galactagogue.**

Therapeutics.

Castor oil is perhaps the best simple purgative we have, and is very useful in cases in which there is slight temporary constipation. Being mild in its action it is very suitable for getting rid of undigested food that is causing diarrhœa, and a dose of castor oil with a minute quantity of laudanum in it is a favorite remedy for certain forms of diarrhœa. It is also especially convenient in pregnancy, after delivery, and when in any abdominal disease, as typhoid fever, peritonitis, or when, after abdominal operations, the irritation caused by the fæces makes it absolutely necessary to get the bowels open. Also, it is very useful for children, or for very old or infirm persons, or for those suffering from

piles or fissures. It is a good purgative to give before and after the use of anthelmintics, [aspidium being excepted.]

Its nauseous taste is the only objection to it. As already mentioned, this can largely be overcome by holding the nose, and there are many forms of castor oil in the market so prepared as to be almost colorless and odorless. It may be taken in capsules, but they are bulky. Lemon juice or coffee conceals the taste to some extent, or the oil may be added to a teaspoonful [4. c.c.] of peppermint water, and then a little brandy added till the oil neither sinks nor [floats] If the inside and rim of the glass are moistened with the vehicle, the oil, which should, if possible, be between two layers of the vehicle, is hardly tasted.

As an enema (castor oil, 1; warm mucilage of starch, 1; mixed thoroughly) it is useful when a mild injection is required.

Breasts.—The leaves of the castor-oil plant applied to the breasts will sometimes induce the secretion of milk. A fluid extract of them may also be taken three or four times a day.

RHEUM.

RHUBARB.—The root [of *Rheum officinale* Baillon (nat. ord. *Polygonaceæ*). *Habitat.*—Western and Central China.

CHARACTERS.—In cylindrical, conical or flattish segments, deprived of the dark brown, corky layer, smoothish or somewhat wrinkled, externally covered with a bright yellowish-brown powder, marked with white, elongated meshes, containing a white, rather spongy tissue, and a number of short, reddish-brown or brownish-yellow striæ; compact, hard; fracture uneven; internally white, with numerous red, irregularly curved and interrupted medullary rays, which are radially parallel only near the cambium line; odor somewhat peculiar, aromatic; taste bitter, somewhat astringent.

COMPOSITION.—The chief constituents are—(1) *Chrysophan*, $C_{27}H_{30}O_{14}$, which yields Chrysophanic Acid, $C_{15}H_{10}O_4$ about 3 per cent. (*Synonyms.*—Rhein. Chrysarobin, *see* Chrysarobinum). (2) *Erythroretin.* (3) *Emodin.* (4) *Phæoretin.* (5) *Aporetin.*] (6) *Rheotannic Acid*, $C_{26}H_{26}O_{14}$, to which the astringency of Rhubarb is due. (7) Lime Oxalate, 35 per cent., to which the grittiness is due.

IMPURITIES.—English Rhubarb; different taste, smell, and excess of starch. Turmeric which is turned brown by Boric Acid.

Dose, 1 to 5 gr.; [.06 to .30 gm. (stomachic); **10 to 30 gr.; .60 to 2.00 gm.]** (purgative).

Preparations.

1. **Extractum Rhei.**—[Extract of Rhubarb. By percolation with Alcohol and water and evaporation.

Dose, 3 to 15 gr.; .20 to 1.00 gm.

2. **Extractum Rhei Fluidum.**—Fluid Extract of Rhubarb. By maceration and percolation with Alcohol and water, and evaporation.

Fluid Extract of Rhubarb is used to make Mistura Rhei et Sodæ and Syrupus Rhei.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

3. **Pilulæ Rhei.**—Pills of Rhubarb. Rhubarb, 20; soap, 6 gm., to make 100 pills. Each pill contains 3 gr.; .20 gm. of Rhubarb.

Dose, 1 to 5 pills.

4. **Pilulæ Rhei Compositæ.**—Compound Pills of Rhubarb. Rhubarb, 13; purified Aloes, 10; Myrrh, 6 gm.; Oil of Peppermint, 0.5 c.c., to make 100 pills. Each pill contains 2 gr.; .13 gm. of Rhubarb.

Dose, 1 to 3 pills.

5. **Pulvis Rhei Compositus.**—Compound Powder of Rhubarb.] *Synonym.*—Gregory's powder. [Rhubarb, 25; Magnesia, 65; Ginger, 10.

Dose, ½ to 1 dr.; 2. to 4. gm.

6. **Tinctura Rhei.**—Tincture of Rhubarb. Rhubarb, 100; Cardamom, 20; Glycerin, 100; Alcohol and water to 1000; by maceration and percolation.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c. (stomachic); 1 to 4 fl. dr.; 4. to 15. c.c. (purgative).

7. **Tinctura Rhei Aromatica.**—Aromatic Tincture of Rhubarb. Rhubarb, 200; Cassia Cinnamon, 40; Cloves, 40; Nutmeg, 20; Glycerin, 100; diluted Alcohol to 1000. By maceration and percolation.

Aromatic Tincture of Rhubarb is used to make Syrupus Rhei Aromaticus.

Dose, 1 to 3 fl. dr.; 4. to 12 c.c.

8. **Tinctura Rhei Dulcis.**—Sweet Tincture of Rhubarb. Rhubarb, 100; Glycyrrhiza, 40; Anise, 40; Cardamom, 10; Glycerin, 100; diluted Alcohol to 1000. By maceration and percolation.

Dose, ½ to 1 fl. oz.; 15. to 30. c.c.

9. **Mistura Rhei et Sodæ.**—Mixture of Rhubarb and Soda. Sodium Bicarbonate, 35; Fluid Extract of Rhubarb, 15; Fluid Extract of Ipecac, 3; Spirit of Peppermint, 25; Glycerin, 350; water to 1000. By solution.

Dose, ¼ to 2 fl. oz.; 8. to 60. c.c.

10. **Syrupus Rhei.**—Syrup of Rhubarb. Fluid Extract of Rhubarb, 100; Potassium Carbonate, 10; Spirit of Cinnamon, 4; Glycerin, 50; water and syrup to 1000. By solution.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

11. **Syrupus Rhei Aromaticus.**—Aromatic Syrup of Rhubarb. Aromatic Tincture of Rhubarb, 150; Syrup, 850. By mixture.

Dose, 1 fl. dr.; 4 c.c. for a child.]

ACTION.

External.—Probably rhubarb would have, to a mild degree, the same action as [chrysarobin], but it is never applied externally.

Internal.—*Alimentary canal.*—In the mouth, rhubarb increases the flow of saliva; and in the stomach, in small doses, it, like any other bitter substance, stimulates the flow of gastric juice, and the vascularity and peristaltic movements of the stomach. It is, therefore, a **stomachic,** and will aid digestion. In large doses it causes **purgation,** producing in from four to eight hours a a liquid motion, colored yellow by the [chrysarobin]. The resinous constituents of rhubarb are said to increase the flow of bile, but certainly its cholagogue action is not sufficiently powerful to completely explain its purgative properties. It is commonly stated to very actively exaggerate intestinal peristalsis, but there is no adequate proof of this. It is liable to gripe. The purgation is followed by constipation; this is ascribed to the rheotannic acid: if so, it is probably absorbed and subsequently re-excreted into the intestines, otherwise it would all be swept away in the purging.

Kidneys.—The coloring matter is excreted in the urine and stains it yellow. The urinary flow is slightly increased.

THERAPEUTICS.

Rhubarb is commonly given to children as a stomachic purgative in indigestion, especially when caused by errors of diet, for it clears away any undigested food, and its stomachic and after-astringent effects are valuable. In the same way it is useful in diarrhœa due to irritation caused by undigested food; here the after-astringency is especially serviceable. A powder of

powdered rhubarb and sodium bicarbonate (which hides the taste) equal parts, with some powdered gentian, forms an excellent stomachic for young children. Rhubarb should never be given alone, because of the griping it causes.

JUGLANS.

[**JUGLANS.** *Synonym.*—Butternut. The bark of the root of *Juglans cinerea* Linné (nat. ord. *Juglandaceæ*), collected in autumn. *Habitat.*—North America.

CHARACTERS.—In flat or curved pieces, about 5 mm. thick; the outer surface dark gray and nearly smooth, or deprived of the soft cork and deep brown; the inner surface smooth and striate; transverse fracture short, delicately checkered, whitish and brown; odor, feeble; taste bitter and somewhat acrid.

COMPOSITION.—(1) *Nucin*, $C_{10}H_6O_8$. (2) *Juglandic Acid.* (3) Fixed Oil, 4 per cent.

Dose, 1 to 2 dr.; 4. to 8. gm.

Preparation.

Extractum Juglandis.—Extract of Juglans. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

USES.

Butternut is a mild cathartic, and resembling rhubarb, in the property of evacuating without debilitating the alimentary canal. It was much employed during the war of the Revolution.]

SENNA.

[**SENNA.**—The leaflets of *Cassia acutifolia* Delile (Alexandria Senna), and of *Cassia angustifolia* Vahn (India Senna); (nat. ord. *Leguminosæ*).

CHARACTERS.—*Alexandria Senna* consists of leaflets about 25 mm. long and 10 mm. broad, lanceolate, or lance-oval, subcoriaceous, brittle, rather pointed, equally oblique at the base, entire, grayish-green, somewhat pubescent, of a peculiar odor, and a nauseous, bitter taste. *Habitat.*—Eastern and Central Africa.

Resembling Senna.—Argel leaves (the leaves of *Solenostemma Argel* Hayne, (nat. ord. *Asclepiadeæ*), which are frequently present; these leaves are thicker, one-veined, wrinkled, glaucous, and even at the base; also the leaves of Uva Ursi and Buchu.

India Senna. Synonym.—Tinnivelly Senna. Consists of leaflets from

3 to 5 cm. long and 10 to 15 mm. broad; lanceolate, acute, unequally oblique at the base, entire, thin, yellowish-green or dull green, nearly smooth; odor peculiar, somewhat tea-like; taste mucilaginous, bitter and nauseous. *Habitat.*—Eastern Africa to India; cultivated.

IMPURITIES.—Stalks, discolored leaves, and other admixtures.]

COMPOSITION OF BOTH KINDS.—The chief constituents are—(1) *Cathartic Acid*, $C_{180}H_{96}N_2SO_{82}$, a black, amorphous Glucoside. It exists as salts of earthy bases, such as Calcium and Magnesium, which are soluble in water. Cathartic Acid is capable of decomposition into Glucose and Cathartogenic Acid. It is the chief purgative principle in Senna and other purgatives. (2) *Sennacrol* and *Sennapicrin*, [$C_{84}H_{58}O_{17}$,] glucosides, which do not, in most preparations, contribute to their action, as they are insoluble in water. (3) *Chrysophanic Acid* in small amounts as a coloring matter (*see* Rhubarb and Chrysarobinum). (4) *Cathartomannit*, [$C_{21}H_{44}O_{19}$], a peculiar unfermentable sugar.

Dose, 1 to 3 dr.; [4. to 12. gm.]

Preparations.

1. **Confectio Sennæ.**—[Confection of Senna. Senna, 100; Oil of Coriander, 5; Fig, 120; Tamarind, 100; Cassia Fistula, 160; Prune, 70; Sugar, 555; water to make 1000. By sifting, digestion and evaporation.

Dose, 1 to 2 dr.; 4. to 8. gm.

2. **Extractum Sennæ Fluidum.**—Fluid Extract of Senna. By maceration, percolation with diluted Alcohol, and evaporation.

Fluid Extract of Senna is used to prepare Syrupus Sarsaparillæ Compositus.

Dose, 1 to 3 fl. dr.; 4. to 12. c.c.

3. **Infusum Sennæ Compositum.**—Compound Infusion of Senna. *Synonym.*—Black Draught. Senna, 60; Manna, 120; Magnesium Sulphate, 120; Fennel, 20; boiling water, 500; cold water to 1000.

Dose, 1 to 2 fl. oz.; 30. to 60. c.c.

4. **Pulvis Glycyrrhizæ Compositus.**—Compound Powder of Glycyrrhiza. *Synonym.*—Compound Liquorice Powder. Senna, 180; Glycyrrhiza, 236; Oil of Fennel, 4; Washed Sulphur, 80; Sugar, 500.

Dose, ½ to 2 dr.; 2. to 8. gm.

5. **Syrupus Sennæ.**—Syrup of Senna. Alexandria Senna, 25; Oil of Coriander, 5; Sugar, 700; Alcohol, 150; water to 1000. By digestion, straining, evaporation and filtration.

Dose, ¼ to 1 fl. oz.; 8. to 30. c.c.]

Action.

External.—None.

Internal.—Senna, because of the cathartic acid in it, stimulates the muscular coat of the intestine, especially the colon, and produces some hyperæmia. Consequently the fluid contents of the small intestine are hurried through the colon, and pale yellow watery stools, containing some undigested food, are the result. Senna acts very feebly or not at all on the biliary secretion. Large doses open the bowels several times and produce **griping**, but not much hyperæmia. Probably there are other substances in senna, besides cathartic acid, having a purgative property, but it is by far the most important. Purgation by senna does not subsequently cause constipation. Some constituents of it are absorbed, and may cause the urine to be red. It will purge, if injected into the veins, and will impart its purgative properties to the milk of nursing women.

Therapeutics.

Senna is a safe, useful purgative for cases of simple constipation. It is, because of its tendency to gripe and its nauseous taste, rarely given alone. The compound liquorice powder is to be preferred to the compound infusion of senna ("black draught"), as this is a [disagreeable] mixture. Senna is largely used to complete the effect of duodenal purgatives, as we see in the old prescription of a blue pill at night and a black draught in the morning. Acting on the colon, it is valuable in slight cases of fæcal collection. Compound liquorice powder is much used in habitual constipation and the constipation of pregnancy. Confection of senna, coated with chocolate, forms the well-known purgative, Tamar Indien, and in this form can be taken by children. It is said that an infusion contains more of the active principles than the other preparations; it soon decomposes, but nitre [1 to 480] will prevent this.

FRANGULA.

[**FRANGULA.** *Synonym.*—Buckthorn. The bark of *Rhamnus Frangula* Linné (nat. ord. *Rhamneæ*), collected at least one year before being used. *Habitat.*—Europe and Northern Asia.

CHARACTERS.—Quilled, about 1 mm. thick; outer surface grayish-brown, or blackish-brown, with numerous small, whitish, transversely-elongated lenticels; inner surface smooth, pale, brownish yellow; fracture in the outer layer short, of a purplish tint; in the inner layer fibrous and pale yellow; when masticated, coloring the saliva yellow; nearly inodorous; taste sweetish and bitter.]

COMPOSITION.—Fresh bark contains a glucoside, *Frangulin* [$C_{20}H_{20}O_{10}$]. This, in the old bark, has become converted into *Emodin*, [$C_{15}H_{10}O_5$] (also found in Rhubarb), to which the value of the bark is due. Two products are obtained from Frangulin by hydrolysis, *Emodin* and *Rhamnose*, $C_6H_{12}O_5$.

Dose, ½ to 1 dr.; 2. to 4. gm.

Preparation.

Extractum Frangulæ Fluidum.—[Fluid Extract of Frangula. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ½ to 2 fl. dr.; 2. to 4. c.c.]

ACTION AND THERAPEUTICS.

The fresh bark is a violent gastro-intestinal irritant, but that which has been kept a year is a mild laxative, acting like senna; it is suitable for children and for use in chronic constipation.

[RHAMNUS PURSHIANA.

CASCARA SAGRADA. *Synonyms.*—Sacred Bark. Chittem Bark. The bark of *Rhamnus Purshiana* De Candolle (nat. ord. *Rhamneæ*). *Habitat.*—Northern Idaho, and westward to the Pacific Coast.

CHARACTERS.—In quills or curved pieces, about 3 to 10 cm. long, and about 2 mm. thick; outer surface brownish gray and whitish; the young bark having numerous, rather broad, pale-colored warts; inner surface yellowish to light brownish, becoming dark brown by age; smooth or finely striate; fracture short, yellowish, in the inner layer of thick bark somewhat fibrous; inodorous; taste bitter.]

COMPOSITION.—The chief constituents are—[(1) Three resins. (2) A neutral substance. (3) Acids. (4) A volatile oil. The fresh bark causes much griping, but the unpleasant effect is lost if the bark is kept and properly cured.]

Dose, ¼ to 1 dr.; 1. to 4. gm.

[*Preparation.*

Extractum Rhamni Purshianæ Fluidum.—Fluid Extract of Rhamnus Purshiana. By maceration and percolation with diluted Alcohol and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.]

Action and Therapeutics.

Cascara Sagrada is a **simple laxative** and aperient, not causing much griping, and resembling in its action frangula bark, but it is more certain and more active. The bitter principle gives it stomachic properties. It is very serviceable for constipation, especially if chronic. A single dose may either be taken in the evening, or 10 to 15 minims; .60 to 1.00 c.c., of the fluid extract may be given three times a day before meals. One advantage of its use is that gradually increasing doses are not required. The fluid extract is very bitter; this taste may be concealed by aromatics, liquorice or sal volatile, and it may be given in chloroform water. The Brit. Pharm. Conference advises the following syrup:—Liquid extract of cascara sagrada, 16; liquid extract of liquorice, 12; Tinctura Carminativa, 1 (*see* Cardamom); syrup to 64. Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

ALOE.

[**ALOE BARBADENSIS.**—Barbadoes Aloes. *Synonym.*—Curacoa Aloes. The inspissated juice of the leaves of *Aloe vera* (Linné) Webb (nat. ord. *Liliaceæ*). *Habitat.*—Island of Barbadoes.

Characters.—In hard masses, orange-brown, opaque, translucent on the edges; fracture waxy or resinous, somewhat conchoidal; odor saffron-like; taste strongly bitter.]

Dose, ½ to 10 gr.; [.03 to .60 gm.]

[**ALOE SOCOTRINA.**—Socotrine Aloes. The inspissated juice of the leaves of *Aloe Perryi* Baker (nat. ord. *Liliaceæ*). *Habitat.*—Eastern Africa.

Characters.—In hard masses, occasionally soft in the interior, opaque, yellowish-brown, orange-brown or dark ruby-red, not greenish, translucent on the edges; fracture resinous, somewhat conchoidal. When breathed upon, it emits a fragrant saffron-like odor. Taste peculiar, strongly bitter. *Solubility.*—Almost entirely soluble in Alcohol and in 4 parts of boiling water. The aqueous solution becomes turbid on cooling and yields a deposit. Moistened with Alcohol] and examined under microscope, Socotrine Aloes exhibits numerous crystals. Socotrine Aloes is less deep in color, less opaque, its powder is brighter and more reddish, and its odor is not nearly so disagreeable as that of Barbadoes Aloes.

Composition.—(1) *Aloin*, *see* p. 430. (2) A Resin. (3) A trace of Gallic

Acid. (4) A trace of a volatile oil giving the odor. *Resembling Aloes.*—Resins of Jalap and Guaiacum, [and Catechu.]

Dose, ½ to 10 gr.; [.03 to .60 gm.]

Preparations.

1. **Aloe Purificata.**—Purified Aloes. Socotrine Aloes, 1000; Alcohol, 200. Heat, strain, and evaporate.

CHARACTERS.—In irregular, brittle pieces, of a dull brown or reddish-brown color, and having the peculiar, aromatic odor of Socotrine Aloes. It is almost entirely soluble in Alcohol.

Purified Aloes are contained in Extractum Colocynthidis Compositum, Pilulæ Rhei Compositæ and Tinctura Benzoini Composita.

Dose, ½ to 10 gr.; .03 to .60 gm.

2. **Extractum Aloes.**—[Extract of Aloes. Socotrine Aloes; by disintegration by boiling in distilled water; filtration and evaporation.

Dose, ½ to 3 gr.; .03 to .20 gm.

3. **Pilulæ Aloes.**—Pills of Aloes. Purified Aloes, 13; Soap, 13 gm.; to make 100 pills. Each pill contains 2 gr.; .13 gm. of Aloes.

Dose, 1 to 4 pills.

4. **Pilulæ Aloes et Asafœtidæ.**—Pills of Aloes and Asafetida. Purified Aloes, 9; Asafetida, 9; Soap, 9 gm.; to make 100 pills. Each pill contains 1⅓ gr.; .09 gm. of Aloes.

Dose, 1 to 5 pills.

5. **Pilulæ Aloes et Ferri.**—Pills of Aloes and Iron. Purified Aloes, 7; dried Ferrous Sulphate, 7; Aromatic Powder, 7 gm.; Confection of Rose, a sufficient quantity to make 100 pills. Each pill contains about 1 gr.; .07 gm., of Aloes.

Dose, 1 to 4 pills.

6. **Pilulæ Aloes et Mastiches.**—Pills of Aloes and Mastic. Purified Aloes, 13; Mastic, 4; Red Rose, 3 gm.; to make 100 pills. Each pill contains 2 gr.; .13 gm., of Aloes.

Dose, 1 to 3 pills.

7. **Pilulæ Aloes et Myrrhæ.**—Pills of Aloes and Myrrh. Purified Aloes, 13; Myrrh, 6; Aromatic Powder, 4 gm.; Syrup, a sufficient quantity to make 100 pills. Each pill contains 2 gr.; .13 gm., of Aloes.

Dose, 2 to 10 pills.

8. **Tinctura Aloes.**—Tincture of Aloes. Purified Aloes, 100; Liquorice Root, 200. Macerate with diluted Alcohol and percolate to 1000.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

9. **Tinctura Aloes et Myrrhæ** —Tincture of Aloes and Myrrh. *Synonym.*—Elixir Proprietatis Paracelsi. Purified Aloes, 100; Myrrh, 100; Liquorice Root, 100. Macerate with Alcohol and water, and percolate to 1000.

Dose, 1 to 2½ fl. dr.; 4. to 10. c.c.]

ALOINUM.—Aloin. [A neutral principle obtained from several varieties of Aloes, chiefly Barbadoes Aloes (yielding *Barbaloin*) and Socotrine or Zanzibar Aloes (yielding *Socaloin*),—differing more or less in chemical composition and physical properties according to the source from which it is derived.

Barbaloin, $C_{17}H_{20}O_7$, is soluble in about 60 parts of water, 20 parts of Alcohol, or 470 parts of Ether.

Socaloin, $C_{15}H_{16}O_7$, is soluble in about 60 parts of water, 30 parts of absolute Alcohol, 380 parts of Ether, or 9 parts of Acetic Ether.]

CHARACTERS.—Minute, acicular crystals, or a microcrystalline powder, varying in color from yellow to yellowish-brown, odorless or possessing a slight odor of Aloes, or a characteristic, bitter taste, and permanent in the air.

Dose, ½ to 2 gr.; [.03 to .12 gm.]

ACTION OF ALOES.

External.—Aloes has no external action on the unbroken skin, but it can be absorbed from a raw surface, for aloes sprinkled on an ulcer, to which it is a slight stimulant, will lead to purging.

Internal. — *Gastro-intestinal tract.*—In the stomach the bitter principle of aloes causes it to act as a **stomachic**, like other bitters. In the intestine it **increases** the rate of the flow of **bile**, and probably the amount secreted. It [has but] little influence in the small intestine, but the muscular coat of the **colon** is powerfully **stimulated**, and the intestinal secretion from that part slightly accelerated. Aloes, therefore, purges, and naturally takes some time, usually fifteen to twenty hours, to act; the motion is well formed, not very soft, as there is so little increased secretion of fluid, and dark colored from the bile in it. Sometimes the drug gripes somewhat, because the muscular contraction it produces is irregular. As it acts chiefly on the lower bowel the habitual use of it may lead to piles.

Female genital organs.—Aloes will aggravate the menstrual

flow; it is therefore an **emmenagogue.** It is excreted by the milk, for aloes given to the mother may purge the child. It is stated also to be excreted in the urine, [and it is quite likely that the habitual use of aloes will result in irritation of the kidneys.]

Therapeutics.

Aloes is an excellent purgative for cases of habitual constipation, many of which are due to an imperfect contraction of the muscular coat of the large intestine. It is very commonly given as a dinner pill (1 gr.; .06 gm., of extract of aloes and ¼ gr.; .015 gm., of extract of nux vomica) to sufferers from chronic constipation, and in these cases its bitter principles acting as stomachics aid digestion. To avoid griping it is well to combine a little extract of hyoscyamus or a li tle extract of belladonna with it. [Aloin does not gripe so much as the preparations of aloes.] One great advantage of aloes is that the dose need not be gradually increased. It is also very commonly given as a pill with nux vomica and a grain or two; .06 or .12 gm., of the dried [ferrous] sulphate to persons suffering from chlorosis and other forms of anæmia. It overcomes the chronic constipation so common in these cases, and some regard this as very important for the cure of the disease. The amenorrhœa so frequently associated with chlorosis is often benefited by aloes, and amenorrhœa due to other causes may also be relieved. Aloes is of great service in many cases of chronic constipation of children. A warm aqueous solution of aloin purges when injected subcutaneously. Aloes must not be given in pregnancy, hæmorrhoids, or menorrhagia. The enema is anthelmintic.

Class III.

SCAMMONIUM.

[**SCAMMONY.**—A resinous exudation from the living root of *Convolvulus Scammonia*, Linné (nat. ord. *Convolvulaceæ*). *Habitat.*—Western Asia.

Characters.—In irregular, angular pieces or circular cakes, greenish-gray or blackish, internally porous, and breaking with an angular fracture, of a resinous lustre; odor peculiar, somewhat cheese-like; taste slightly acrid; powder gray or greenish-gray.]

IMPURITIES.—Chalk and Starch.

COMPOSITION.—The chief constituents are: (1) The resin (*see* below), 75 to 95 per cent. (2) Gum, 5 to 20 per cent. (3) Starch.

Dose, 5 to 15 gr.; [.30 to 1.00 gm]

Preparation.

Resina Scammonii.—Resin of Scammony.

SOURCE.—[Digest Scammony with successive portions of boiling Alcohol, distil off the Alcohol, precipitate the Resin with water, wash it several times, and dry with gentle heat.]

CHARACTERS.—[Yellowish brown or brownish-yellow masses or fragments, breaking with glossy, resinous fracture, translucent at the edges; or a yellowish-white or grayish-white powder, having a faint, peculiar odor, and a slight, peculiar taste. *Solubility.* – In Alcohol in all proportions; also wholly soluble in Ether and in Oil of Turpentine.

COMPOSITION.—The chief constituent is *Scammonin*, $C_{88}H_{156}O_{40}$, probably the same as *Jalapin*, *see* p. 433.]

IMPURITIES.—Guaiacum resin, which blues potato. Jalap resin, insoluble in Ether.

Resin of Scammony is contained in Extractum Colocynthidis Compositum.

Dose, 1 to 8 gr.; [.06 to .50 gm.]

ACTION.

Gastro-intestinal tract. — Scammony has no effect till it reaches the duodenum. With the bile it forms a **strongly purgative** compound, powerfully stimulating the intestinal glands and causing a profuse secretion of intestinal fluids. There is some exaggeration of vascularity, some irregular stimulation of the muscular coat, but these are comparatively slight, and there is little if any addition to the biliary flow. As a result of these actions, in about four hours there is a profuse **watery evacuation** of the bowels. The drug is, therefore, a powerful **hydragogue cathartic**, and in large doses, a strong gastro-intestinal irritant. Its action is attended with some griping. It produces no effect if injected into the blood, and therefore acts only locally on the intestine. It is anthelmintic to both round-worms and tape-worms.

THERAPEUTICS.

Scammony being a prompt purgative, obstinate constipation ı either children or adults may be treated with it. It may also e given as an anthelmintic.

JALAPA.

[**JALAP.**—The tuberous root of *Ipomœa Jalapa*, Nuttall (nat. ord. *Convolvulaceæ*.) *Habitat.*—Eastern Mexico.

CHARACTERS.—Napiform, pyriform or oblong, varying in size, the large ots incised, more or less wrinkled, dark brown, with lighter-colored spots, ıd short, transverse ridges; hard, compact; internally pale grayish-brown, ith numerous concentric circles composed of small resin-cells; fracture resin- ıs, not fibrous; odor slight, but peculiar, smoky and sweetish; taste sweetish ıd acrid. On exhausting 100 parts of Jalap by Alcohol, concentrating the ıcture, and pouring it into water, a precipitate of resin should be obtained, hich, after washing with water and drying, should weigh not less than 12 arts, and of which not over 10 per cent. should be soluble in Ether.]

COMPOSITION.—The chief constituents are: (1) the official *resin*, (*see* elow), 7 to 22 per cent. mostly *Jalapurgin*, $C_{62}H_{100}O_{32}$. (2) A soft resin.

Dose, 5 to 20 gr.; [.30 to 1.20 gm.]

Preparations.

1. **Extractum Jalapæ.**—[Extract of Jalap. By maceration and percolation with Alcohol, and evaporation.

Extract of Jalap is contained in Pilulæ Catharticæ Compositæ and Pilulæ Catharticæ Vegetabiles.

Dose, 2 to 8 gr.; .12 to .50 gm.

2. **Pulvis Jalapæ Compositus.**—Compound Powder of Jalap. *Synonym.*—Pulvis Purgans. Jalap, 35; Potassium Bitartrate, 65.

Dose, ½ to 1 dr.; 1. to 4. gm.

3. **Resina Jalapæ.**—Resin of Jalap.

SOURCE.—By maceration with Alcohol, percolation, distil off the Alcohol, and precipitation with water, and drying.

CHARACTERS.—Yellowish-brown, or brown masses or fragments, breaking with a resinous, glossy fracture, translucent at the edges, or a yellowish-gray or yellowish-brown powder, having a slight, peculiar odor, and a somewhat acrid taste.]

COMPOSITION.—The chief constituents are—(1) *Jalapurgin*, a Glucoside, a hard substance insoluble in Ether, more irritant than Jalapin, and probably the most active ingredient of Jalap. (2) *Jalapin* or *Convolvulin*, [probably identical with *Scammonin*.] This is a

soft resinous substance, soluble in Ether. It is found in Jalap wood and Jalap stalk. (3) Starch and Gum. *Resembling Jalap Resin.*—Aloes, which is bitter.

Dose, 1 to 5 gr.; [.06 to .30 gm.]

Action.

The mode of action of jalap is precisely **the same as that of scammony,** with only two exceptions. It causes a greater secretion of intestinal juice, and is therefore more hydragogue; it stimulates the vessels and muscular coat less, and therefore is less irritant and griping.

Therapeutics.

Jalap is very largely used as a hydragogue purgative when we want to draw off large quantities of fluid; therefore it is especially suitable for patients with Bright's disease, for those suffering from uræmia, and for those with dropsy from any cause. Large doses should not be given if the intestinal mucous membrane is liable to inflame easily. It is occasionally employed for severe constipation.

[BRYONIA.

BRYONIA.—*Synonym.*—Bryony. The root of *Bryonia alba*, and of *Bryonia dioica* Linné (nat. ord. *Cucurbitaceæ*). *Habitat.*—Central and Southern Europe.

Characters.—In transverse sections abont 5 cm. in diameter, the bark gray-brown, rough, thin, the central portion whitish or grayish, with numerous, small, projecting wood-bundles arranged in circles and radiating lines; fracture short; inodorous; taste disagreeably bitter.

Composition.—The chief constituents are—(1) *Bryonin*, $C_{34}H_{48}O_{19}$, a bitter glucoside; (2) Resin; (3) Starch; (4) Gum.

Dose, 10 to 60 gr.; .60 to 4.00 gm.

Preparation.

Tinctura Bryoniæ.—Tincture of Bryonia. Bryonia, 100; by maceration and percolation with Alcohol to 1000.

Dose, 1 to 5 fl. dr.; 4. to 20. c.c.

Uses.

Bryonia is an active hydragogue cathartic, but has been superseded by jalap.

OLEUM [TIGLII.

CROTON OIL.—A fixed oil expressed from the seed of *Croton Tiglium* Linné (nat. ord. *Euphorbiaceæ*). *Habitat.*—India and Philippine Islands; cultivated.

CHARACTERS.—A pale yellow or brownish-yellow, somewhat viscid, and slightly fluorescent liquid, having a slight fatty odor, and a mild, oily, afterwards acrid and burning taste; when applied to the skin, it produces rubefaction or a pustular eruption. Sp. gr., 0.940 to 0.960. *Solubility.*—When fresh, in about 60 parts of Alcohol, the solubility increasing by age; feebly soluble in Ether, Chloroform, Carbon Disulphide, and in fixed or volatile oils.]

COMPOSITION.—The chief constituents are—(1) Several volatile acids (1 per cent. in all); these give the odor. [*Tiglinic Acid*, $C_5H_8O_2$,] is the characteristic one; the others are Acetic, Isobutyric, Isovalerianic, Formic, Lauric, Myristic, Palmitic, Stearic, existing as glycerides. (2) Several fatty acids, both free and combined to form fats. (3) *Crotonol*, [$C_{30}H_{24}O_4$(?)] a substance which is non-purgative, but is capable of causing cutaneous irritation.

Dose, ¼ to 2 m.; [.015 to .12 c.c.] on a lump of sugar, or mixed with Castor Oil or Vaseline and placed at the back of the mouth.

Croton seeds are not official, but it is important to recognize them. They are [13 mm.] long, [8 mm.] broad, ovoid and bluntly oblong, covered with a brown shell, which on scraping becomes black. The kernel is white and oily. They yield 50 to 60 per cent. of Croton Oil. They are known from Castor-oil seeds, which are like them, by the fact that the Castor-oil seeds are bright, polished and mottled.

ACTION.

External.—Croton oil is one of the **most powerful irritants** in the pharmacopœia. A drop placed on the skin causes **redness**, burning pain, and quickly a crop of vesicles (vesication); these rapidly become **pustules** (pustulation), and the surrounding skin becomes red and œdematous. [The pustules may be umbilicated, but often from various pustules it is that they may group in one.]

Internal.—*Gastro-intestinal tract.*—Very small a dose has been taken there is considerable griping and abdominal pain. In an hour or two the bowels are opened, and the stool subsequently more watery, the intestinal peristalsis being more and more hurried. The action of croton aggravates the irritation of the stomach and intestines, the mucous membrane of which becomes red, œdematous and slate-staining. There is a great

increase of the intestinal secretion, but none of the bile. The drug produces, in fact, severe **enteritis,** and to a less extent gastritis. The motions may contain blood. These effects are all due to the local [action] of the croton oil. It is probable that the peristaltic movements are increased also; whether this is a result of the irritation, or of some action of the drug exerted after absorption, is not known. Croton oil applied to the skin may cause free purgation.

Therapeutics.

External.—Croton oil was formerly employed externally as an irritant and a counter-irritant for inflamed joints, pleurisy, bronchitis, phthisis, etc.; but it is not often so used now, as the scars left after the suppuration are very unsightly, the application is too painful and the inflammation induced too severe. A little croton oil spread over an area not exceeding that of a [dime] may be applied to set up suppuration in the scalp, and so destroy an inveterate patch of ringworm if it is wished to cure it quickly. The croton oil will certainly do this, but the resulting suppuration is so severe that the remedy should be used with care, and only when all others have failed. The liniment [of the B. P. 15 per cent. in equal parts of oil of cajuput and alcohol], well diluted, is occasionally employed to stimulate the skin in alopecia.

Internal.—Croton oil should only be given in very obstinate constipation not due to organic obstruction, and only one dose should be administered. Not more than one or two drops should be prescribed. Constipation due to lead poisoning and fæcal impactions are sometimes suitable cases. Placed on the back of the tongue, it is, on account of its small bulk, a useful purgative for lunatics who refuse to take anything, and for unconscious patients, because in such cases it is quickly swallowed reflexly; hence also it is commonly given to those who are unconscious from apoplexy. It must never be administered to children, to pregnant women, to feeble subjects, to those with hæmorrhoids, nor to those suffering from peritonitis, gastritis, or enteritis.

COLOCYNTHIS.

[**COLOCYNTH.** *Synonym.*—Bitter Apple. The fruit of *Citrullus Colocynthis*, Schrader (nat. ord. *Cucurbitaceæ*), deprived of its rind. *Habitat.*—Southern and Western Asia, Northern and Southern Africa, Greece and Spain.

CHARACTERS.—From 5 to 10 cm. in diameter; globular; white or yellowish-white; light, spongy; readily breaking into three wedge-shaped pieces, each containing, near the rounded surface, many flat, ovate, brown seeds; inodorous; taste intensely bitter. The pulp only should be used, the seeds being separated and rejected.]

IMPURITIES.—Seeds and cortex.

COMPOSITION.—The chief constituents are—(1) *Colocynthin*, [$C_{56}H_{84}O_{23}$,] about 2 per cent., an amorphous or crystalline, bitter, active glucoside, readily soluble in water and Alcohol. (2) Resinous matter having the names of *Citrullin* and *Colocynthitin*, insoluble in water.

Dose, 2 to 8 gr.; [.12 to .50 gm.]

Preparations.

[1. **Extractum Colocynthidis.**—Extract of Colocynth. By maceration with diluted Alcohol, expression and straining; percolate and evaporate.

Dose, ½ to 2 gr.; .03 to .12 gm.

2. **Extractum Colocynthidis Compositum.**—Compound Extract of Colocynth. Extract of Colocynth, 160; purified Aloes, 500; Cardamom, 60; Resin of Scammony, 140; Soap, 140; Alcohol, 100. By melting, straining and reducing to powder.

Dose, 5 to 15 gr.; .30 to 1.00 gm.

3. **Pilulæ Catharticæ Compositæ.**—*See* Mercury, p. 194.

4. **Pilulæ Catharticæ Vegetabiles.**—Vegetable Cathartic Pills. Compound Extract of Colocynth, 60; Extract of Hyoscyamus, 30; Extract of Jalap, 30; Extract of Leptandra, 15; Resin of Podophyllum, 15 gm.; Oil of Peppermint, 8 c.c.; Water, to make 1000 pills.

Dose, 1 to 5 pills.]

ACTION.

In small doses colocynth acts as a simple **bitter,** increasing the gastric and intestinal secretions and improving the appetite. In larger doses it augments the flow of bile and succus entericus, stimulates the muscular coat, causes a little griping, and leads to the evacuation of a **watery motion.** In still larger doses the

hypersecretion is excessive and the griping is severe because the muscular coat is powerfully irritated, and several abundant watery motions result. The drug may therefore be called **drastic, hydragogue, and cathartic.** The depression produced may be considerable.

THERAPEUTICS.

Colocynth should never be given alone, because of the griping it causes In the colocynth and hyoscyamus pill, 1 part of colocynth, 2 parts of hyoscyamus, which is often prescribed, the hyoscyamus prevents this painful result. Colocynth is an excellent purgative for producing a single abundant evacuation of the bowels in chronic constipation, such as that so often met with in persons suffering from hepatic disorder, and in those confined to bed. Because of the watery character of the motions it may be given in ascites or Bright's disease, but jalap or scammony is usually preferred. It is too irritant for habitual use. It should never be administered if there is any suspicion of intestinal or gastric inflammation, nor in pregnancy. It is often combined with milder purgatives. A diuretic action has been claimed for it, but this is unimportant.

ELATERINUM.

[**ELATERIN.**—$C_{20}H_{28}O_5$=347.20. A neutral principle obtained from Elaterium, a substance deposited by the juice of the fruit of *Ecballium Elaterium* (Linné) A. Richard (nat. ord. *Cucurbitaceæ*). *Habitat.*—Western Asia, Northern Africa and Southern Europe; cultivated.

SOURCE.—Exhaust Elaterium with Chloroform. Add Ether, wash the resulting precipitate with Ether; purify by recrystallization with Chloroform.

CHARACTERS.—Minute, white, hexagonal scales, or prismatic crystals, without odor, and having a slightly acrid, bitter taste; permanent in the air. *Solubility.*—In 4250 parts of water, and in 337 parts of Alcohol; also soluble in 543 parts of Ether, or in 2.4 parts of Chloroform.]

Dose, $\frac{1}{20}$ **to** $\frac{1}{12}$ **gr.; [.003 to .005 gm.]**

Preparation.

[**Trituratio Elaterini.**—Trituration of Elaterin. Elaterin, 10; Sugar of Milk, 90.

Dose, ½ **to 1 gr.; .03 to .06 gm.]**

Action.

Elaterin is **violently purgative,** producing profuse watery evacuations, attended with griping and much prostration. It acts like colocynth, and except that it is much more energetic, the description of that drug will apply to it. It increases the salivary secretion. When injected subcutaneously it purges. It is the most powerful hydragogue purgative in the Pharmacopœia.

Therapeutics.

Elaterin should not be given in ordinary constipation, as it is too violent in its effects, but on account of the large amount of fluid it brings away it is in suitable cases very useful in ascites and in Bright's disease The same cautions as were enumerated for colocynth are still more necessary here. It should not be given, or only with great care, in heart disease, on account of the depression produced.

CAMBOGIA.

[**GAMBOGE.**—A gum-resin obtained from *Garcinia Hanburii* Hooker filius (nat. ord. *Guttiferæ*). *Habitat.*—Anam, Camboja and Siam.

Characters.—In cylindrical pieces, sometimes hollow in the centre, 2 to 5 cm. in diameter, longitudinally striate on the surface; fracture flattish-conchoidal, of a waxy lustre, orange-red; in powder bright yellow; inodorous; taste very acrid; the powder sternutatory. *Solubility.*—It is partly soluble in Alcohol and in Ether.]

Composition.—The chief constituents are—(1) A bright yellow Resin, *Gambogic Acid,* [66 to 80 per cent. (2) Gum, 16 to 26 per cent.] This is soluble, so that an emulsion of Gambogic Acid is formed with water.

Impurities.—Starch, woody fibre.

[*Gamboge is contained in* Pilulæ Catharticæ Compositæ.]

Dose, 1 to 5 gr.; [.06 to .30 gm.]

Action.

Gamboge is a **drastic hydragogue purgative,** causing much griping, and, in large doses, great irritation of the alimentary canal. Most of it passes in the fæces, but some is absorbed, causing the urine to be yellow. It is slightly diuretic.

North America, in rich woods and thickets.

CHARACTERS.—Of horizontal growth, consisti
long, flattish cylindrical, about 5 mm. thick, but som
which has a circular scar on the upper side, a tuft of
fragile roots on the lower side, and is sometimes brar
somewhat wrinkled, orange-brown, internally white
of small wood-bundles; pith large; nearly inodoro
what bitter and acrid.]

COMPOSITION.—The chief constituents are:—
(*see* below), 4 to 5 per cent. (2) *Podophyllinic Acid*

Dose, 5 to 20 gr.; .30 to 1.20 gm.

Preparations.

1. **Extractum Podophylli.**—Extract of
eration and percolation with Alcohol and wat
and evaporation.

Dose, 2 to 10 gr.; .12 to .60 gm.

2. **Extractum Podophylli Fluidum.**—
phyllum. By maceration and percolation
distillation of Alcohol and solution.

Dose, 5 to 20 m.; .30 to 1.20 c.c.]

3. **Resina Podophylli.**—[Resin of Po
Podophyllin.

SOURCE.—By maceration and percolation
the Alcohol, precipitation of Resin in Hyd
wash and dry.

[$C_{28}H_{34}O_9 + 2H_2O$, *which is said to be a mixture of Picropodophyllin*, 75 to 80 per cent., the purgative principle, and *Podophyllinic Acid* which is inactive; with these are associated minor resins, and *Podophyllquercitin*, a coloring principle.]

INCOMPATIBLES.—Water precipitates it from [Alcohol]; acids precipitate it from Ammonia.

[*Resin of Podophyllum is contained in* Pilulæ Cathartica Vegetabiles.]

Dose, ⅛ to 1 gr.; [.008 to .06 gm.]

ACTION.

External.—It has no external action unless applied to raw surfaces, from which it may be absorbed, and then it will purge.

Internal.—*Gastro-intestinal tract.*—Podophyllin has a bitter taste. It is in large doses a powerful gastro-intestinal irritant, and has caused death. In medicinal doses it gives rise to much griping pain, perhaps some nausea, and in about ten hours there is an **evacuation of the bowels**; the motion, which is liquid, is deeply stained with bile. The pain shows that the muscular coat is stimulated, the liquidity that probably more intestinal fluid is secreted, and the color that more bile is poured into the intestine. In small doses podophyllin decidedly increases the secretion of bile, in purgative doses it does not, although more bile is poured from the bladder into the intestine. It is thus a direct and indirect **cholagogue**. It probably acts after absorption, for all its effects can be produced if it is injected subcutaneously.

THERAPEUTICS.

Podophyllin is only used for its **cholagogue purgative** action. It is especially suitable for constipation due to [illegible] whether functional, as in the [illegible] goes by the name of [illegible] rhosis and cancer. It must be remembered that [illegible] griping, it should be [illegible] drug to overcome this; [illegible] therefore be swept away [illegible] with quickly acting purgatives [illegible]

States, south to Georgia, and west to M

CHARACTERS.—Of horizontal growt
5 mm. thick, somewhat flattened, bent
with cup-shaped scars on the upper si
thin, blackish bark, a hard, yellowish woo
six-rayed pith; roots thin, wrinkled, very
feebly acrid.

COMPOSITION.—The chief constituent
talline glucoside. (2) A saccharine princi
(3) Possibly a Volatile Alkaloid.

Dose, ¼ to 1. dr.; 1. to 4. gm.

Preparatio

1. Extractum Leptandræ.—
ation and percolation with Alcohol a
Extract of Leptandra is cont
tabiles.

Dose, 1 to 3 gr.; .06 to .20 g

2. Extractum Leptandræ F
tandra. By maceration and percol
evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4.

ACTION AND

Recent leptandra root acts as a
times as an emetic. It is

CHARACTERS.—Root several-headed, branching, reddish-brown; stem about 50 cm. long, light green, hairy; leaves about 15 cm. long, thin, petiolate, the upper ones smaller and sessile, light green, on the lower side glaucous, lyrate-pinnatifid, the pinnæ ovate-oblong, obtuse, coarsely crenate or incised and the terminal one often three-lobed; flowers in small, long peduncled umbels with two sepals and four yellow petals; capsule linear, two-valved and many seeded. The fresh plant contains a saffron-colored milk-juice, and has an unpleasant odor and acrid taste.

COMPOSITION.—(1) *Chelerythrine*, $C_{21}H_{17}NO_4$. (2) *Sanguinarine*, $C_{29}H_{15}NO_4$. (3) *Chelidonine*, $C_{20}H_{19}NO_5$. (4) *Protopine*, $C_{20}H_{17}NO_5$. (5) Chelidoxanthin, Chelidonic and Chelidoninic Acids.

Dose, 15 to 60 gr.; 1. to 4. gm.

USES.

Celandine has been found useful in jaundice, apparently possessing a stimulating effect upon the hepatic secretions. It was the chief ingredient in the old *Decoctum ad Ictericos* of the Edinburgh Pharmacopœia.]

IRIS.

IRIS. [*Synonym.*—Blue Flag. The rhizome and roots of *Iris versicolor* Linné (nat. ord. *Irideæ*). *Habitat.*—North America, in swampy localities.

CHARACTERS.—Rhizome of horizontal growth, consisting of joints, 5 to 10 cm. long, cylindrical in the lower half, flattish near the upper extremity, and terminated by a circular scar, annulated from the leaf-sheaths, grayish-brown; roots long, simple, crowded near the broad end; odor slight; taste acrid and nauseous.

COMPOSITION.—The chief constituents are—(1) An acrid resin. (2) Possibly an alkaloid. (3) Fat. (4) A camphoraceous body.

Dose, 10 to 30 gr.; .60 to 2.00 gm.

Preparations.

1. **Extractum Iridis.**—Extract of Iris. By maceration and percolation with Alcohol, and evaporation.

Dose, 1 to 3 gr.; .06 to .20 gm.

2. **Extractum Iridis Fluidum.**—Fluid Extract of Iris. By maceration and percolation with Alcohol, and evaporation.

Dose, 10 to 30 m.; .60 to 2.00 c.c.]

United States, southward to Florida, and westward
woods.

CHARACTERS.—In quilled or curved pieces, f
outer surface, ash-gray, with blackish patches, deta
scales; inner surface whitish or slightly tawny, sm
whitish, the inner layers of a laminated appearance;
sweetish, somewhat bitter and acrid.]

COMPOSITION.—The chief constituents are—(1)
[bitter, amorphous. (2) *Atropurpurin*, a crystalline
Tartaric and Malic Acids.

Dose, 1 to 2 dr.; 4. to 8. gm.]

Preparation.

Extractum Euonymi.—Extract of Eu
Euonymin. By maceration and percolation w
distillation of the Alcohol, and evaporation.

Dose, 1 to 5 gr.; .06 to .30 gm.]

ACTION AND THERAPEUTIC

In small doses euonymin stimulates the a
gastric juice; in larger, it is irritant to th
cathartic. It **increases** the amount of **bil**
intestine. It has slight diuretic and expecto
is only used as a purgative for those cases
which the liver is disordered.

internally, they stimulate the gastro-intestinal tract, increasing its vascularity, the flow of saliva, of gastric juice, and of succus entericus; and they excite its unstriped muscular fibres. Thus in moderate doses they are stomachics and carminatives; in large doses they are gastro-intestinal irritants. Their irritation of the stomach reflexly stimulates the heart and the central nervous system. They are absorbed and excreted by the skin, which they may thus irritate, and by the bronchial mucous membrane, which they consequently stimulate its vascularity, increasing the amount of secretion from it, the expulsive power of its unstriped muscles, and reflexly this irritation leads to coughing; consequently they are expectorants. They are also largely excreted by the kidneys, which are stimulated even to inflammation, and hence these drugs are often diuretic; and by the genito-urinary mucous membrane, which is also stimulated, often so energetically that it becomes inflamed. Some volatile oils act strongly in all these ways; others act much more powerfully in some than in others. They will be classified according to the tissue on which they chiefly act, or for the action for which they are mostly used.

CLASS I.—**Volatile oils** (or substances containing them), acting chiefly upon, or used chiefly for their stimulation of the skin.

Turpentine, Oil of Turpentine, Rectified Oil of Turpentine, Terebene, Terpin Hydrate, Oil of Erigeron, Pix Liquida, Oil of Cade, Burgundy Pitch, Resin, Canada Turpentine, Mustard, Oil of Cajuput, Eucalyptus, Oil of Rosemary, Arnica, Mezereum.

CLASS II.—Volatile oils (or substances containing them) acting chiefly upon, or used chiefly for their stimulation of the gastro-intestinal tract.

Pyrethrum, Cloves, Pimenta, Pepper, Nutmeg, Mace, Cinnamon, Capsicum, Ginger, Cardamom, Sumbul, Oil of Lavender Flowers, Oil of Bergamot, Peppermint, Spearmint, Anise, Illicium, Coriander, Fennel, Caraway, Sambucus, Oil of Pennyroyal, Absinthium.

CLASS III.—Volatile oils (or substances containing them) acting chiefly upon the stomach, so as to reflexly stimulate the heart and central nervous systems, or chiefly used for this purpose.

Valerian, Cypripedium, Asafœtida, Ammoniacum, Myrrh.

CLASS IV.—Volatile oils (or substances containing them) acting chiefly upon, or used chiefly for their stimulation of the bronchial mucous membrane.

Balsam of Peru, Balsam of Tolu, Storax.

CLASS V.—Volatile oils (or substances containing them) acting chiefly upon, or used chiefly for their stimulation of the kidneys and genito-urinary tract.

Oil of Juniper, Buchu, Copaiba, Oil of Thyme, Cubeb, Oil of Santal, Matico.

Miller, and from other species of *Pinus*
United States; in the Atlantic and Gulf St

CHARACTERS.—In yellowish, opaque
crumbly-crystalline in the interior, of a tere

OLEUM TEREBI

OIL OF TURPENTINE.—[A vol

CHARACTERS.—A thin, colorless liquid,
taste, both of which become stronger and less
the air. Sp. gr. 0.855 to 0.870. Dissolves Re
Wax, Sulphur, Phosphorus and Iodine. *Solu*
Alcohol, the solution being neutral or slightly
ble in an equal volume of Glacial Acetic Acid
agents it is converted into a Camphor. Old C
agent; it readily absorbs Oxygen, and become
French Oil of Turpentine is lævo-rotatory, som
tima; English Oil of Turpentine, which m
Russian Oil of Turpentine are dextro-rotatory.

COMPOSITION.—Oil of Turpentine is a mi
carbons (terpenes), all having the formula C_{10}H
points and the direction in which they rotate th
pentine contains [from 20 to 30 per cent.] of
being a typical terpene, therefore yields a cr
isomerides of it, having the formula $C_{10}H_{16}$, ar
[Cubeb, Juniper,] Caraway, Cloves, etc. T
$C_{10}H_{16}$ is $C_{10}H_{16}O$, which is pharma

SOURCE.—Oil of Turpentine, 1; Lime Water, 6 volumes. By shaking and distillation.

CHARACTERS.—A thin, colorless liquid, having the general properties mentioned under Oil of Turpentine. Sp. gr. 0.855 to 0.865.

Dose, 5 to 30 m.; .30 to 2.00 c.c., or ½ to 4 fl. dr.; 2. to 15. c.c., anthelmintic.

2. Linimentum Terebinthinæ.—Turpentine Liniment. Resin Cerate, 650; Oil of Turpentine, 350. By melting and mixing.]

ACTION.

External.—Oil of turpentine has, to a marked degree, the action of other volatile oils. Thus applied to the skin, especially if rubbed in, it causes the vessels to dilate, there is a sense of warmth, the part becomes red, and subsequently common sensation is blunted. The oil is therefore **rubefacient, irritant,** and **counter-irritant.** If enough is applied it is a vesicant. Like the other volatile oils it is **antiseptic** and **disinfectant.** It is absorbed by the unbroken skin.

Internal.—*Alimentary canal.*—Oil of turpentine has the same stimulant effect when locally applied to the mouth and pharynx as it has on the skin, and in the stomach it powerfully dilates the vessels, increases peristalsis and the gastric secretion, and **reflexly stimulates the heart,** but on account of its nauseous taste it is not used for these properties, which it has in common with other volatile oils. Its effects on the intestine are the same as those on the stomach, the most marked being its energetic stimulation of the muscular coats, hence it is a strong **carminative,** expelling gas from the bowels. If a large amount is given the excitation of the muscular coat leads to **purging,** the motions often containing much blood, hæmorrhage resulting from the great vascular dilatation. Oil of turpentine is **anthelmintic,** killing the tapeworm when administered in doses of [½] to 4 fl. dr. [2. to 15. c.c.]; but this treatment may cause severe symptoms. When given as an enema it kills the threadworm.

Circulation.—Oil of turpentine is readily absorbed. We do not know in what form it circulates. Statements concerning its action on the heart and vessels are very discordant, probably be-

and the blood-pressure falls.

Respiration —When inhaled, oil of
bronchial mucous membrane as it does o
dilating the vessels, increasing and dis
stimulating the muscles of the bronchi
cough. If given internally, [since] some
bronchial mucous membrane, similar eff
the same time the activity of the res
increased, so that the drug is a **powerful**

Nervous system.—Oil of turpentine in
depressant to the nervous system, produc
sleepiness, and unsteady gait. Toxic d
paralyze the sensory nerves; consequentl
ished.

Kidneys.—It acts more powerfully on
other volatile oil. Even moderate doses r
loins, scanty, high-colored urine, albumin
The **urinary passages** are also **irri**
owing to muscular spasm, there is diffic
micturition is painful, and a sensation of
is present (these symptoms constitute stran
has been given the urine may be comple
pentine causes the urine to smell of violet

[containing oxygen (*see* p. 216)] is an antidote to phosphorus, and it is stated that [that] and [the] French oil are preferable.

THERAPEUTICS.

External.—Oil of turpentine is very largely employed as an irritant or counter-irritant in various forms of chronic inflammation, such as osteo-arthritis, bronchitis, or pleurisy. The liniment forms a useful application. It may also be rubbed in over painful areas, as in neuralgia, myalgia, rheumatic pains, lumbago, etc. Sometimes it is used as a parasiticide for ringworm.

Internal.—*Stomach and intestines.*—[For internal use the rectified oil only should be prescribed.] It is not prescribed for its carminative and stomachic effects, though given either by the mouth or as an enema it is often very efficacious in removing the intestinal distension due to gas. If it is used as an anthelmintic, [½] to 4 fl dr. [2. to 15. c.c.] emulsified in mucilage and followed by a dose of castor oil should be given. Sometimes it promptly relieves intestinal hæmorrhage, such as that due to typhoid fever. [It is also used in this disease as an antiseptic.] Whenever it is prescribed as a hæmostatic, considerable doses, 30 to 60 minims [2. to 4. c.c.] should be administered every hour for a few hours.

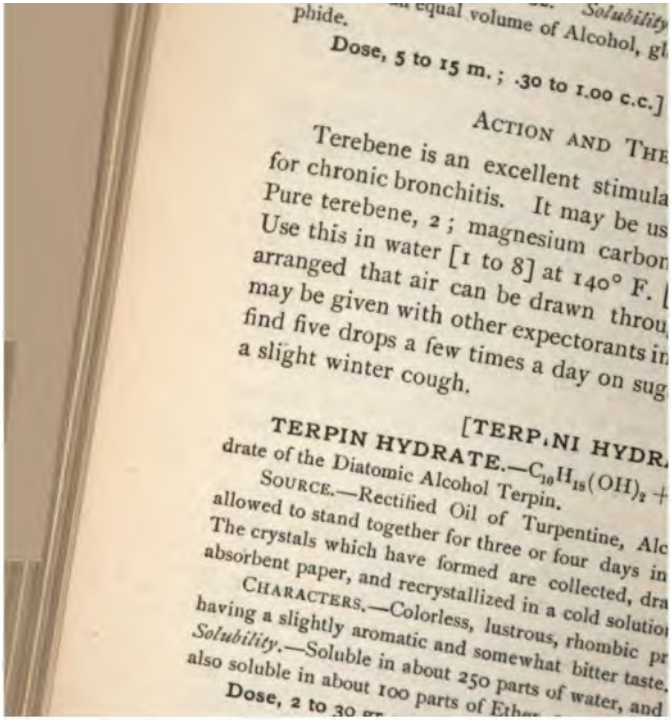
Circulation.—It is not employed to influence this, except as a hæmostatic. It has the reputation of being fairly efficacious in arresting hæmorrhage. It may be given in hæmoptysis, gastric ulcer, and other conditions attended with bleeding.

Respiration.—It is not much used as an inhalation, but it might be employed to disinfect foul bronchial secretions, and to stimulate the mucous membrane in chronic bronchitis.

It should be remembered that oil of turpentine must be given internally with great care because of its liability to cause inflammation of the kidneys; indeed, this fact and its [unpleasant] taste accounts for its not being so often administered as would otherwise be the case. It should never be given to the subjects of Bright's disease.

[TEREBENUM.

TEREBENE.—$C_{10}H_{16} = 135.7$. A liquid consisting chiefly of Pinene,



phide. ... equal volume of Alcohol, gl *Solubility*

Dose, 5 to 15 m.; .30 to 1.00 c.c.]

ACTION AND THE

Terebene is an excellent stimula for chronic bronchitis. It may be us Pure terebene, 2; magnesium carbon Use this in water [1 to 8] at 140° F. arranged that air can be drawn throu may be given with other expectorants in find five drops a few times a day on sug a slight winter cough.

[TERPINI HYDR

TERPIN HYDRATE.—$C_{10}H_{18}(OH)_2 +$ drate of the Diatomic Alcohol Terpin.

SOURCE.—Rectified Oil of Turpentine, Alc allowed to stand together for three or four days in The crystals which have formed are collected, dra absorbent paper, and recrystallized in a cold solutio

CHARACTERS.—Colorless, lustrous, rhombic pr having a slightly aromatic and somewhat bitter taste.

Solubility.—Soluble in about 250 parts of water, and also soluble in about 100 parts of Ethe

Dose, 2 to 30 gr

cough, and rarely in the treatment of chronic nephritis, chronic cystitis and gonorrhœa.

OLEUM ERIGERONTIS.

OIL OF ERIGERON.—*Synonym.*—Oil of Fleabane. A volatile oil distilled from the fresh, flowering herb of *Erigeron canadense* Linné (nat. ord. *Compositæ.*) *Habitat.*—North America, in fields and waste places; naturalized in other countries.

CHARACTERS.—A pale yellow, limpid liquid, becoming darker and thicker by age and exposure to the air, having a peculiar aromatic, persistent odor, and an aromatic, slightly pungent taste. Sp. gr., about 0.850, increasing with age. *Solubility.*—In an equal volume of Alcohol.

Dose, 5 to 15 m.; .30 to 1.00 c.c.

USES.

Oil of erigeron is less irritant and less efficient than oil of turpentine. It has been used in diarrhœa, dysentery and hæmorrhages, in much the same way.]

PIX LIQUIDA.

TAR.—[An empyreumatic oleoresin obtained by the destructive distillation of the wood of *Pinus palustris*, Miller, and of other species of *Pinus* (nat. ord. *Coniferæ.*) *Habitat.*—United States.

CHARACTERS.—Thick, viscid, semi-fluid, blackish-brown, heavier than water, transparent in thin layers, becoming granular and opaque with age; odor empyreumatic, terebinthinate; taste sharp, empyreumatic. *Solubility.*—Slightly, in water; soluble in Alcohol, fixed or volatile oils, and solution of Potassium or Sodium Hydrate.] On distillation it gives off an empyreumatic oil (oil of tar), which is official (*see* below), and pyroligneous acid. What remains behind is pitch. This is black, solid, melting in boiling water.

COMPOSITION.—Tar is a very complex substance. The chief constituents are—(1) Oil of Tar, (*see* below). (2) Cresols (Creosote.) (3) Guaiacol. (4) Phenol. (5) Pyrocatechin, or Catechol, $C_6H_6O_2$. (6) Acetic Acid. (7) Acetone. (8) Xylol. (9) Toluol. (10) Methylic Alcohol. (11) Resins.

Dose, ¼ to 1 dr.; [1. to 4. gm.,] in the form of pills.

Preparations.

1. [**Syrupus Picis Liquidæ.**—Syrup of Tar. Tar, 75; water, 150; boiling distilled water, 400; Sugar, 800; Glycerin, 100; distilled water to 1000. By solution, decantation and filtration.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

External.—Tar has precisely the sam
pentine, but it is not so powerful, therefore
rarely proceeds to the stage of vesication;
sult if the tar is rubbed in.

Internal.—It is very liable to upset di
it causes epigastric pain, vomiting, severe
and other symptoms of carbolic acid po
Some of its constituents are excreted b
especially the bronchial, on which it acts a
lating expectorant.

THERAPEUTICS.

External.—Tar ointment is often app
chronic skin diseases, such as psoriasis and
cause of its mildly anæsthetic action, it i
pruritus.

Wood tar is the only official form of ta
used in medicine. The prepared form of
heating and stirring coal tar at 120° F. [48

Liquor Picis Carbonis is a favorite pr
made thus: Dissolve resin soap, 1; (*see* p. 4
prepared coal tar, 4; digest at 125° F. [

Wood tar is only given as an expectorant, and it is very valuable for chronic bronchitis. It may be prescribed as a pill or as the syrup, or as Vinum Picis (a saturated solution of wood tar in sherry, dose 1 to 4 fl. dr. [4. to 15. c.c.]), or as theFrench preparation Eau de Goudron. Tar water is made by stirring wood tar with water [1 to 4] for fifteen minutes and decanting. The dose is a pint [480. c.c.] daily. It may be used externally as a wash.

OLEUM CADINUM.

OIL OF CADE.—[*Synonym.*—Oleum Juniperi Empyreumaticum. A product of the dry distillation of the wood of *Juniperus Oxycedrus* Linnê (nat. ord. *Coniferæ*). *Habitat.*—Mediterranean districts of Northern Africa, Spain, Portugal and France; in waste places and on stony hill-sides.

CHARACTERS.—A brownish or dark brown, clear, thick liquid, having a tarry odor, and an empyreumatic, burning, somewhat bitter taste. Sp. gr., about 0.990. *Solubility.*—Almost insoluble in water; only partially soluble in Alcohol, but is completely soluble in Ether, Chloroform, or Carbon Disulphide.]

COMPOSITION.—Probably much the same as that of Tar.

ACTION AND THERAPEUTICS.

Oil of cade has the same action on the skin as tar, but it is preferable as the odor is pleasanter. The diseases treated by the application of it are psoriasis, chronic eczema, and pruritus. A usual formula is oil of cade, 1; soft soap, 4; alcohol, 4; or an ointment is used, made by melting with it an equal part of yellow wax.

PIX BURGUNDICA.

BURGUNDY PITCH.—[The prepared, resinous exudation of *Abies excelsa* Poiret (nat. ord. *Coniferæ*). *Habitat.*—Europe, in the Southern parts, in mountainous districts.

CHARACTERS.—Hard, yet gradually taking the form of the vessels in which it is kept; brittle, with a shining, conchoidal fracture, opaque or translucent, reddish-brown or yellowish-brown, odor agreeably terebinthinate; taste aromatic, sweetish, not bitter. *Solubility.*—Almost entirely in Glacial Acetic Acid, and partly soluble in cold Alcohol.]

IMPURITIES.—Palm Oil and Resin which are detected by not being soluble in Glacial Acetic Acid.

COMPOSITION.—[The chief constituents are—(1) Resin; (2) A volatile oil, $C_{10}H_{16}$, in variable proportion.]

Burgundy Pitch is contained in Emplastrum Ferri [and Emplastrum Opii.]

the strained liquid.]

ACTION AND THERAPEU

Pitch is used as a basis for plasters. It
the skin.

RESINA.

RESIN.—[*Synonyms.*—Colophony. Rosin.
tilling off the Volatile Oil from Turpentine.

CHARACTERS.—A transparent, amber-colored
pulverizable; fracture glossy and shallow-conchoid
terebinthinate. Sp. gr. 1.070 to 1.080. *Solubility*
fixed or volatile oils; also in solution of Potassium o

COMPOSITION.—Resin may be considered as
$C_{44}H_{62}O_{47}$, 80 to 90 per cent.]

Resin is contained in Ceratum Cantharidis.

Preparations.

[1. **Ceratum Resinæ.**—Resin Cerate
Ointment. Resin, 350; Yellow Wax, 150;
Resin Cerate is contained in Linimentum Tereb

2. **Emplastrum Resinæ.**—Resin Plaste
Plaster. Resin, 140; Lead Plaster, 800; Ye
Resin Plaster is contained in Emplastrum Ar
donnæ, and Emplastrum Capsici.]

ACTION AND THERAPEUT

Resin is antiseptic and slightly stimulant

[TEREBINTHINA CANADENSIS.

CANADA TURPENTINE.—*Synonyms.*—Canada Balsam. Balsam of Fir. A liquid oleoresin obtained from *Abies balsamea* (Linné) Miller (nat. ord. *Coniferæ*). *Habitat.*—Canada and Northern United States, west to Minnesota, and south along the mountains to Virginia.

CHARACTERS.—A yellowish or faintly greenish, transparent, viscid liquid, of an agreeable, terebinthinate odor, and a bitterish, slightly acrid taste. When exposed to the air, it gradually dries, forming a transparent mass. *Solubility.*—Completely in Ether, Chloroform or Benzol.

COMPOSITION.—(1) A volatile oil, 20 to 30 per cent. (2) Resin. (3) A bitter principle soluble in water.

Canada Balsam is contained in Collodium Flexile.

ACTION AND THERAPEUTICS.

Canada Balsam is rarely used except for its physical property of drying to form an adhesive varnish. It has the same action as oil of turpentine.]

SINAPIS.

[1. **SINAPIS ALBA.**—White Mustard. The seed of *Brassica alba* (Linné) Hooker filius et Thompson (nat. ord. *Cruciferæ*). *Habitat.*—Asia and Southern Europe; cultivated.

CHARACTERS.—About 2 mm. in diameter, almost globular, with a circular hilum; testa yellowish, finely pitted, hard; embryo oily, with a curved radicle, and two cotyledons, one folded over the other; free from starch; inodorous; taste pungent and acrid.]

COMPOSITION.—The chief constituents are—(1) A bland fixed oil, [20 to 25 per cent.] (2) *Sinalbin*, [$C_{30}H_{44}N_2S_2O_{16}$,] and *Myrosin;* the latter is a ferment, and in contact with water converts *Sinalbin*, which is a Glucoside, into a fixed pungent body, very acrid, but really volatile, called *Acrinyl Sulphocyanide*, [C_7H_7ONCS], Glucose, and *Sinapine Sulphate*, [$C_{16}H_{23}NO_5H_2SO_4$].

2. SINAPIS NIGRA.—[Black Mustard. The seed of *Brassica nigra* (Linné) Koch (nat. ord. *Crucifereæ*). *Habitat.*—Asia and Southern Europe; cultivated.

CHARACTERS.—About 1 mm. in diameter, almost globular, with a circular hilum; testa blackish-brown or grayish-brown, finely pitted, hard, embryo oily, with a curved radicle, and two cotyledons, one folded over the other; free from starch; inodorous when dry, but when triturated with water, of a pungent, penetrating, irritating odor; taste pungent and acrid.]

COMPOSITION.—The chief constituents are—(1) The same fixed oil as the white seeds, about 25 per cent. (2) *Sinigrin* (which is Potassium Myronate,

Prep

[Charta Sinapis.—Must
colate the Mustard with a suffi
powder and dry; add to the sc
and Carbon Disulphide, 100; a
piece of rather stiff, well-sized p

3. OLEUM SINAPIS [VOI

Allyl Sulphocyanide, C_3H_5CNS. A vc
by maceration with water and subsequer

CHARACTERS.—A colorless or pale
liquid, having a very pungent and acri
1.029. *Solubility.*—Freely in Alcohol,

Prepara

Linimentum Sinapis Com
Mustard. Volatile Oil of Musta
200; Camphor, 60; Castor Oil, 1

ACTION OF

External.—Mustard is a ty
Thus it first produces dilatation of
ness of the skin (**rubefacient** effec
Because of the irritant action of
a severe burning

that is to say, the stimulation of the cutaneous nerves reflexly leads to a dilatation of the vessels of the viscera under the seat of application.

This excitation of the sensory nerves is sufficiently powerful to **reflexly stimulate the heart and respiration**, and sometimes to restore consciousness after fainting.

Internal.—*Gastro-intestinal tract.*—Mustard acts here as an irritant. Taken in the usual small quantities as a condiment, it causes a sense of warmth in the stomach, moderately **stimulates** the secretion of gastric juice and the peristaltic movements, and therefore **sharpens the appetite**. A dose of one to four teaspoonsful [4. to 15. gm.] stirred up in a tumbler of water is sufficiently irritating to be a direct stomachic **emetic**, causing prompt vomiting without the depression which usually accompanies emetics, because the mustard reflexly stimulates the heart and respiration.

THERAPEUTICS.

External.—A mustard poultice (equal parts of mustard and ground flaxseed) is a very common and efficacious application as an irritant and counter-irritant in rheumatism, pleurisy, pneumonia, bronchitis, pericarditis, and many inflammatory diseases. In the manner already explained, it will, when applied to the skin, soothe pain in gastralgia, colic, painful diseases of the chest, neuralgia, lumbago, etc. The paper or any of the mustard leaves that are sold, moistened in water, form an excellent application. Often the local application of mustard over the stomach relieves vomiting. A large mustard poultice applied to the legs was formerly used as a reflex stimulant in cases of syncope, asphyxia, and coma.

Common colds and febrile conditions, especially in children, are often treated by placing the feet and legs or the whole body in mustard and water as hot as can be borne [1 to 128], the object being by the cutaneous dilatation to withdraw blood from the inflamed part. A mustard sitz-bath may be taken at the time of the expected period, to induce menstruation.

Internal.—**Mustard** is used as a condiment, and also as an

emetic. It is especially valuable for poisoning by narcotics, because of its reflex stimulant effects.

OLEUM CAJUPUTI.

[**OIL OF CAJUPUT.**—A volatile oil distilled from the leaves of *Melaleuca Leucadendron* Linné (nat. ord. *Myrtaceæ*). *Habitat.*—East Indian Islands.

CHARACTERS.—A light, thin, bluish-green, or, after rectification, colorless liquid, having a peculiar, agreeable, distinctly camphoraceous odor, and an aromatic, bitterish taste. Sp. gr. 0.922 to 0.929. *Solubility.*—Readily in Alcohol.

COMPOSITION.—The chief constituents are—(1) *Cajuputol*, $C_{10}H_{18}O$; said to be identical with *Cineol*. (2) *Cajuputene hydrate*, $C_{10}H_{18}O$]

IMPURITIES.—Copper, and other oils.

Dose, 1 to 5 m.; [.06 to .30 c.c.]

ACTION.

The action of cajuput oil is exactly the same as that of the oil of cloves (*see* p. 465).

THERAPEUTICS.

External.—Cajuput oil is used as a stimulant, irritant, and counter-irritant—usually diluted with sweet oil—for all sorts of purposes when any of these effects are needed. Thus it is rubbed in for chilblains, myalgia, rheumatic pains, chronic inflammatory conditions of the joints or periosteum. It has also been employed as a parasiticide for *Tinea tonsurans*. The only objection to its use is its strong smell.

Internal.—It is occasionally given in dyspepsia, usually combined with other remedies, for the sake of its carminative, stomachic, and antispasmodic effects; it may be taken on sugar.

EUCALYPTUS.

[**EUCALYPTUS.**—The leaves of *Eucalyptus globulus* Labillardière (nat ord. *Myrtaceæ*), collected from the older parts of the tree. *Habitat.*—Australia; cultivated in subtropical countries.

CHARACTERS.—Petiolate, lanceolately scythe-shaped, from 15 to 30 cm. long, rounded below, tapering above, entire, leathery, grayish-green, glandular, feather-veined between the midrib and marginal veins; odor strongly camphoraceous; taste pungently aromatic and somewhat cooling, bitter and astringent.

COMPOSITION.—(1) A volatile oil (*see* below); (2) *Cerylic Alcohol*; (3) A Crystallizable Fatty Acid; (4) A Crystallizable Resin.

Dose, ½ to 2 dr.; 2. to 8. gm.

Preparation.

Extractum Eucalypti Fluidum.—Fluid Extract of Eucalyptus. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

OLEUM EUCALYPTI.—[Oil of Eucalyptus. A volatile oil distilled from the fresh leaves of *Eucalyptus globulus* Labillardière, *Eucalyptus oleosa* F. v. Mueller, and some other species of *Eucalyptus* (nat. ord. *Myrtaceæ*).

CHARACTERS.—A colorless or faintly yellowish liquid, having a characteristic, aromatic, somewhat camphoraceous odor, and a pungent, spicy, and cooling taste. Sp. gr., 0.915 to 0.925. *Solubility.*—In all proportions, in Alcohol, Carbon Disulphide, or glacial Acetic Acid. The oils from different species of *Eucalyptus* vary very much.

COMPOSITION.—The chief constituents are—(1) A volatile oil, *Eucalyptol*, $C_{10}H_{18}O$ or *Cineol* (about 70 per cent.); (2) *Cymene*, $C_{10}H_{14}$; (3) *Eucalyptene*, $C_{10}H_{16}$.]

INCOMPATIBLES.—Alkalies, mineral acids, and metallic salts.

Dose, 5 to 30 m.; [.30 to 2.00 c.c.]

[EUCALYPTOL.—Eucalyptol. $C_{10}H_{18}O = 153.66$. A neutral body obtained from the volatile oil of *Eucalyptus globulus* Labillardière, and of some other species of *Eucalyptus* (nat. ord. *Myrtaceæ*).

SOURCE.—In the distillation of Eucalyptus leaves, crude Eucalyptol comes over between 338° and 352.4° F.; 170° and 178° C., and is purified by redistillation from Caustic Potash or Calcium Chloride.

CHARACTERS.—A colorless liquid, having a characteristic, aromatic, and distinctly camphoraceous odor, and a pungent, spicy, and cooling taste. Sp. gr., 0.930. *Solubility.*—In all proportions, in Alcohol, Carbon Disulphide, and glacial Acetic Acid.

Dose, 5 to 30 m.; .30 to 2.00 c.c.]

ACTION.

External.—Oil of eucalyptus is much less irritant when applied externally than other volatile oils, but if its vapor is confined it will produce vesication and pustulation. It is powerfully **antiseptic** and **disinfectant.** Old oil is more anti-

septic than new, probably from the greater amount of ozone it contains.

Internal.—*Gastro-intestinal tract.*—In medicinal doses oil of eucalyptus is stomachic, having the same action as oil of cloves. In large doses it produces severe gastro-intestinal irritation, as shown by vomiting, diarrhœa, and abdominal pain.

Circulation.—It, **like quinine,** arrests the movements of the white blood-corpuscles; and it likewise resembles this drug in its antipyretic and its antiperiodic actions, and also, it is said, in causing contraction of spleen; but quinine is in all respects the more energetic. In medicinal doses the heart is stimulated by oil of eucalyptus, and the blood-pressure rises; probably these effects are reflex from the stomach. After large quantities the action of the heart is enfeebled, and temperature falls.

Respiration.—Small doses slightly accelerate, poisonous doses slow respiration.

Nervous system.—Large doses are powerfully depressant to the brain, to the medulla, and to the spinal cord, abolishing reflex action. Death occurs from paralysis of respiration.

Mucus membranes, kidneys, and skin.—Like other volatile oils, eucalyptus is excreted by all these channels. It imparts its odor to and disinfects the breath and the urine. It stimulates the organs by which it is excreted, consequently it is a diaphoretic, a stimulating expectorant, a diuretic, and a stimulant to the genito-urinary tract. Large doses cause renal congestion.

Therapeutics.

External.—It is used as an antiseptic for wounds, sores, and ulcers. It is three times as powerful as carbolic acid, and is therefore preferred by some surgeons. A eucalyptus gauze has been prepared as a dressing for wounds, which may be washed with a weak solution of the oil in alcohol. An ointment of oil of eucalyptus, 8; iodoform, 1; paraffin and vaselin, 40, is applied to chancres. An emulsion of the oil is used as an urethral injection. It would probably be an efficient parasiticide.

Internal.—A vapor or the spray of oil of eucalyptus has been recommended for diphtheria and fetid bronchitis, and it is sometimes given by the mouth to correct the fœtor of the expectoration. Occasionally it is used for its stomachic, carminative effects, especially if the fæces are very foul smelling, and some employ it in cystitis and pyelitis. It has been prescribed in septicæmia. As an antiperiodic for ague and an antipyretic it is far inferior to quinine [In most cases eucalyptol can be substituted for the oil with advantage.]

OLEUM ROSMARINI.

OIL OF ROSEMARY.—[A volatile oil distilled from the leaves of *Rosmarinus officinalis* Linné (nat. ord. *Labiatæ*). *Habitat.*—Basin of the Mediterranean; cultivated.

CHARACTERS.—A colorless or pale yellow, limpid liquid, having the characteristic, pungent odor of Rosemary, and a warm, somewhat camphoraceous taste. Sp. gr., 0.895 to 0.915. *Solubility.*—In an equal volume of Alcohol; also soluble in an equal volume of Glacial Acetic Acid.]

COMPOSITION.—The chief constituents are—(1) A terpene, [$C_{10}H_{16}$, 80 per cent. (2) *Cineol*, $C_{10}H_{18}O$. (3) *Borneol*, $C_{10}H_{16}O$.]

Oil of Rosemary is contained in Linimentum Saponis and Tinctura Lavandulæ Composita.

Dose, 1 to 5 m.; [.06 to .30 c.c.]

ACTION AND THERAPEUTICS.

Oil of rosemary has an action similar to that of other aromatic volatile oils. It is very commonly used to give a pleasant scent to lotions and other preparations which are used externally.

ARNICA.

[ARNICÆ FLORES.—Arnica Flowers. The flower heads of *Arnica montana* Linné (nat. ord. *Compositæ*). *Habitat.*—Europe and Northern Asia; in mountainous districts.

CHARACTERS.—Heads about 3 cm. broad, depressed-roundish, consisting of scaly involucre in two rows, and a small, nearly flat, hairy receptacle, bearing about sixteen yellow, strap-shaped, ten-nerved ray-florets, and numerous yellow, five-toothed, tubular disk-florets, having slender, spindle-shaped achenes, crowned by a hairy pappus. Odor feeble, aromatic; taste bitter and acrid.

COMPOSITION.—(1) *Arnicin*, amorphous, yellow, acrid, bitter principle;

septic than new, probably from the greater ... 3) *Caprylic* ... contains.

Internal.—*Gastro-intestinal tract* ... of eucalyptus is stomachic, having ... of Arnica Flowers. Arni... cloves. In large doses it produce... d Alcohol to 1000. ... tion, as shown by vomiting, di...]

Circulation.—It, like qu... ot. The rhizome and roots of *Arnica* ... white blood-corpuscles; ar... antipyretic and its an... out 5 cm. long, and 3 or 4 mm. thick; exter... causing contraction c... al scars; internally whitish, with a rather thick ... more energetic. ... resin-cells, surrounding the short, yellowish wood... oil of eucalyptu... pithy. The roots numerous, thin, fragile, grayish... effects are ref... bark containing a circle of resin-cells. Odor somewhat ... action of t... gently aromatic and bitter.] *Resembling Arnica.*—Valerian ... having a characteristic odor; Veratrum Viride, having ...

Resp... ... slow r...

Composition.—The same as of the flowers.

Dose, 5 to 20 gr.; [.30 to 1.20 gm.]

th...

Preparations.

[1. **Extractum Arnicæ Radicis.**—Extract of Arnica Root. By maceration and percolation with diluted Alcohol, and evaporation.

Extract of Arnica Root is used to make Emplastrum Arnicæ.

Dose, 5 to 10 gr.; .30 to .60 gm.

2. **Extractum Arnicæ Radicis Fluidum.**—Fluid Extract of Arnica Root. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 5 to 20 m.; 30. to 1.20 c.c.

3. **Tinctura Arnicæ Radicis.**—Tincture of Arnica Root. Arnica Root, 100; by maceration and percolation with Alcohol and water to 1000.

Dose, 5 to 10 m.; .30 to .60 c.c.

4. **Emplastrum Arnicæ.**—Arnica Plaster. Extract of Arnica Root, 330; resin plaster, 670.]

Action and Therapeutics.

The action of arnica is the same as that of volatile oils generally. Externally the tincture is used as an application to bruises, but it is very doubtful how far its good effects are owing

to the [alcohol], and how far to any increase of cutaneous vascularity due to the volatile oil of the arnica.

It is rarely given internally, but in small doses it is a stomachic, a carminative, and a reflex stimulant, and in larger doses causes vomiting and purging. It is excreted by the kidneys and mucous membranes, and it has been credited with obscure effects on the central nervous system.

MEZEREUM.

[**MEZEREUM.** *Synonym.*—Mezereon. The bark of *Daphne Mezereum* Linné, and other species of *Daphne* (nat. ord. *Thymelæaceæ*). *Habitat.*—Europe in mountainous regions, eastward to Siberia; spontaneous in Canada and New England.

CHARACTERS.—In long thin bands, usually folded or rolled into disks; outer surface yellowish or brownish yellow, with transverse scars, and minute, blackish dots, underneath of a light greenish color; inner surface whitish, silky; bast in transverse layers, very tough; inodorous; taste very acrid.

COMPOSITION.—The chief constituents are—(1) *Mezerein*, a soft, acrid resin. (2) An acrid, rubefacient, volatile oil. (3) *Daphnin*, $C_{15}H_{16}O_9 + 2H_2O$, a bitter glucoside in fine needles or rectangular plates. (4) *Coccogin*, $C_{20}H_{22}O_8$, a bitter principle.]

Mezereum is contained in Decoctum Sarsaparillæ Compositum and Extractum Sarsaparillæ Compositum Fluidum.

Preparation.

Extractum Mezerei [Fluidum.—Fluid Extract of Mezereum. By maceration and percolation with Alcohol and evaporation.

Fluid Extract of Mezereum is used in Linamentum Sinapis Compositum.

Dose, 5 to 15 m.; .30 to 1.00 c.c.]

ACTION AND THERAPEUTICS.

External.—Mezereon has the same action as volatile oils generally. It is a powerful rubefacient and vesicant externally, and is used chiefly in the compound mustard liniment, where it excites the same effects and is employed for the same purposes as the oil of mustard.

Internal.—It is a gastric stimulant, producing, in large doses, vomiting and diarrhœa.

Class II.

Those used chiefly for their action on the gastro-intestinal tract.

PYRETHRUM.

PYRETHRUM.—*Synonym.*—[Pellitory. The root of *Anacyclus Pyrethrum* (Linné) De Candolle (nat. ord. *Compositæ*). *Habitat.*—Highlands of Northern Africa.

Characters.—From 5 to 10 cm. long, and 1 to 2 cm. thick, somewhat fusiform, nearly simple, annulate above, wrinkled below, externally dark grayish-brown; internally brownish-white; fracture short; bark rather thick, containing two circles of resin-cells, and surrounding the slender wood-bundles and medullary rays, the latter having about four circles of shining resin-cells; inodorous, pungent and very acrid.] *Resembling Pyrethrum.*—Taraxacum, which is darker, and has not a burning taste.

Composition.—The chief constituents are—(1) Two Acrid Oils. (2) An [acrid, brown Resin. (3) Inulin, 50 per cent., which in many plants replaces starch.

Dose, ½ to 1 dr.; 2. to 4. gm.]

Preparation.

Tinctura Pyrethri.—[Tincture of Pyrethrum. Pyrethrum, 200; by maceration and percolation with Alcohol and water to 1000.]

Action and Therapeutics.

Pyrethrum is a powerful sialogogue, and causes a burning sensation in the mouth, followed by numbness and tingling. Small quantities give a pleasant taste to tooth powders.

CARYOPHYLLUS.

CLOVES.—[The unexpanded flowers of *Eugenia aromatica* (Linné) O. Kuntze (nat. ord. *Myrtaceæ*). *Habitat.*—Molucca Islands; cultivated in tropical countries.

Characters.—About 15 mm. long, dark brown, consisting of a subcylindrical, solid and granular calyx-tube, terminated by four teeth, and surmounted by a globular head, formed of four petals, which cover numerous curved stamens, and one style. Cloves emit oil, when scratched, and have a strong, aromatic odor, and a pungent, spicy taste.]

Composition. —The chief constituents are—(1) *Oleum Caryophylli*, [(*see* below), 18 per cent.] (2) *Eugenin*, [$C_{10}H_{12}O_2$], a crystalline body. (3) *Caryophyllin*, [$C_{10}H_{16}O$,] a neutral body isomeric with Camphor.

[*Cloves are contained in* Vinum Opii, Tinctura Rhei Aromatica, and Tinctura Lavendulæ Composita.

Dose, 5 to 30 gr. ; .30 to 2.00 gm.]

OLEUM CARYOPHYLLI.—[Oil of Cloves. A volatile oil distilled from Cloves.

CHARACTERS.—A pale yellow, thin liquid, becoming darker and thicker by age and exposure to the air, having a strongly aromatic odor of Cloves, and a pungent and spicy taste. Sp. gr., 1.060 to 1.067. *Solubility.*—Soluble in an equal volume of Alcohol; also soluble in an equal volume of glacial Acetic Acid.]

COMPOSITION.—The chief constituents are—(1) *Eugenol* (*Synonym.*—Eugenic Acid), $C_{10}H_{12}O_2$, which chemically resembles Phenol, and forms permanent Salts with Alkalies. (2) A terpene, $C_{15}H_{24}$.

INCOMPATIBLES.—Lime water, salts of iron, mineral acids, and gelatin.

Dose, 1 to 5 m. ; [.06 to .30 c.c.]

ACTION OF CLOVES AND OIL OF CLOVES.

Oil of cloves is a typical example of a volatile oil the most important actions of which are exerted in the stomach.

External.—When rubbed into the skin it is **stimulant, rubefacient, irritant,** and **counter-irritant,** and gives rise to considerable vascular dilatation. At first it causes a sensation of **tingling** and pain, which afterwards is replaced by local **anæsthesia.** It is a parasiticide and antiseptic.

Internal.—*Mouth.*—In the mouth, oil of cloves produces the same effects as on the skin : there is a burning sensation accompanied by vascular dilatation and an increased flow of saliva, and followed by local anæsthesia. Cloves stimulate the nerves of taste, and being volatile and aromatic, those of smell also; by both these means taste is sharpened.

Stomach.—The stimulant effect of cloves is experienced here. The **vessels** are **dilated, peristalsis** is **accelerated,** the secretion of **gastric juice** is **excited,** and as cloves are pleasant and aromatic, they do not ordinarily produce nausea; consequently the **appetite** is **increased.** The combined effect of these actions is to aid digestive processes—therefore oil of cloves is **stomachic;** and to facilitate the expulsion of gas—thus it is **carminative.** The stimulation of the gastric nerves to a slight

extent reflexly affects the heart in the same way as alcohol; therefore the **rate and force of the pulse** are moderately **increased.**

Intestines.—Here likewise oil of cloves dilates the vessels, and stimulates the secretion and the muscular coat of the intestine; consequently colicky pains due to irregular contraction of it are relieved, and flatus is expelled.

Circulation.—Oil of cloves is readily absorbed from the intestine, circulates in the blood, and is said to increase the number of white corpuscles It may to a slight extent stimulate the heart directly, but the greater part of the stimulation of the heart excited by it is reflex from the stomach. It is credited with the power of arresting painful spasmodic contractions in various parts of the body. It can, as we have seen, do this in the intestine, and possibly it may have to a slight extent the same action in the bronchial tubes, heart, etc. This causes it to be called **antispasmodic.**

Mucous membranes.—Like other volatile oils it is excreted by the kidneys, skin, bronchi, and genito-urinary tract, and in passing through these structures will act as a **stimulating disinfectant** to their secretion; but oil of cloves is never used for these purposes.

Therapeutics of Cloves and Oil of Cloves.

External.—Oil of cloves is too expensive for frequent external application, but on account of its local anæsthetic effect it has been used for neuralgia. It is employed to give a pleasant scent to liniments.

Internal.—The oil is sometimes dropped into decayed teeth to relieve pain. Cloves are frequently employed in cookery for their taste, and because they stimulate the appetite and aid digestion. The oil or infusion [B. P., 1 in 40] may be used medicinally as a stomachic, as a carminative, as an antispasmodic, or to relieve colicky pains in indigestion. It will be noticed that oil of cloves is sometimes combined with preparations of scammony,

of castor oil, and of colocynth. This is to prevent the griping these purgatives might otherwise cause.

PIMENTA.

PIMENTA.—[*Synonym.*—Allspice. The nearly ripe fruit of *Pimenta officinalis* Lindley (nat. ord. *Myrtaceæ.*) *Habitat.*—Tropical America; cultivated.

CHARACTERS.—About 5 mm. in diameter, nearly globular, crowned with the short, four-parted calyx or its remnants, and a short style; brownish or brownish gray, granular and glandular, two-celled; each cell containing one brown plano-convex, roundish-reniform seed; odor and taste pungently aromatic, clove-like.] *Resembling Pimenta* — Pepper, which has no calyx; Cubeb, which is stalked.

COMPOSITION.—The chief ingredient is (1) [*Oleum Pimentæ*, (*see* below), 10 per cent. (2) A fixed Oil, green and acrid.

Dose, 5 to 30 gr.; .30 to 2.00 gm.]

OLEUM PIMENTÆ.—[Oil of Pimenta. *Synonym.*—Oil of Allspice. A volatile oil distilled from Pimenta.

CHARACTERS.—A colorless or pale yellow liquid, having a strong, aromatic, Clove-like odor, and a pungent, spicy taste. It becomes darker and thicker by age and exposure to the air. Sp. gr., 1.045 to 1.055. *Solubility.*—With an equal volume of Alcohol it forms a clear solution.

Oil of Pimenta is used in Spiritus Myrciæ.

Dose, 1 to 5 m.; .06 to .30 c.c.]

ACTION AND THERAPEUTICS.

The action and uses of pimenta and its oil are precisely the same as those of cloves and oil of cloves.

PIPER.

PEPPER.—[*Synonym.*—Black Pepper.—The unripe fruit of *Piper Nigrum*, Linné (nat. ord. *Piperaceæ.*) *Habitat.*—India; cultivated in the tropics.

CHARACTERS.—Globular, about 4 mm. in diameter, reticulately wrinkled, brownish-black, or grayish-black, internally lighter, hollow, with an undeveloped embryo; odor aromatic; taste pungently spicy.] *Resembling Black Pepper.*—Pimenta, which has a calyx; Cubeb, which is stalked.

COMPOSITION.—The chief constituents are—(1) An Oleoresin. (2) *Piperin*, [(*see* below), 6 to 8 per cent. (3) Volatile Oil, 1 to 2 per cent.

Dose, 5 to 20 gr.; .30 to 1.20 gm.

Preparation.

Oleoresina Piperis.—Oleoresin of Pepper. By percolation with Ether, distillation and evaporation of the residue.

Dose, ½ to 1 gr.; [10 to 20 gm.]

[PIPERIDINE.—Piperin, $C_5H_{11}N$]—$C_{17}H_{19}NO_3$. A neutral principle obtained from Pepper, and obtainable also from other plants of the natural order *Piperaceæ*.

Characters.—[illegible] lowish, shining, prismatic crystals, [illegible] and almost [illegible] it in the mouth, but on prolonged [illegible] producing a [illegible]ion. Permanent in the air. *Solubility*.—Almost insoluble in [illegible]le in 30 parts of Alcohol; also slightly soluble in Et[illegible] [illegible]orphine, it decomposes into Piperic Acid, $C_{12}H_{10}O_4$, and [illegible]roline, $C_5H_{11}N$.]

Dose, 1 to 10 g[illegible]

Pepper, because of its vo[illegible]l, acts like other substances containing volatile oils; thus [illegible]ally it is at first rubefacient and counter-irritant, and subsequently it acts as an anodyne. Internally it increases the secretions of the mouth, and in the stomach it is stomachic and carminative. During its excretion it stimulates the mucous membrane of the genito-urinary tract. Piperin is believed to be a feeble antipyretic and antiperiodic.

Therapeutics.

Occasionally pepper is used externally as an irritant for the same class of cases as mustard. Internally it may be applied in the form of a gargle, as a stimulant for the relaxed conditions of the throat. It is taken in the form of a condiment for its stomachic properties. The confection [B. P., Pepper, 2; Caraway, 3; Honey, 16]. or pepper lozenges are given empirically to relieve hæmorrhoids, ulcers of the rectum, and fissures of the anus.

MYRISTICA.

NUTMEG.—The [seed of *Myristica Fragrans* Houttuyn (nat. ord. *Myristicaceæ*), deprived of its testa. *Habitat.*—Molucca Islands; cultivated in tropical countries.

Characters.—Oval or roundish-ovate, about 25 mm. long, light brown,

reticulately furrowed, with a circular scar on the broad end; internally pale brownish, with dark orange-brown veins, and of a fatty lustre; odor strongly aromatic; taste aromatic, warm, and somewhat bitter.]

COMPOSITION.—The chief constituents are—(1) The *fixed oil*, 25 to 30 per cent. [which is chiefly myristin.] (2) The *volatile oil*, (*see* below), 2 to 8 per cent.

Nutmeg is contained in [Pulvis Aromaticus, and Tinctura Lavandulæ Composita.]

Dose, 5 to 15 gr.; [.30 to 1.00 gm.]

OLEUM MYRISTICÆ.—[Oil of Nutmeg. A volatile oil distilled from Nutmeg.

CHARACTERS.—A thin, colorless or pale yellowish liquid, having the characteristic odor of Nutmeg, and a warm, spicy taste. It becomes darker and thicker by age and exposure to the air. Sp. gr., 0.870 to 0.900. *Solubility.*—In an equal volume of Alcohol.]

COMPOSITION.—The chief constituents are—(1) *Myristicene*, [$C_{10}H_{16}$,], a terpene. (2) *Myristicol*, [$C_{10}H_{14}O_2$,] a stearopten, [isomeric with Carvol].

Oil of Nutmeg is contained in Spiritus Ammoniæ Aromaticus.

Dose, 1 to 3 m.; [.06 to .20 c.c.]

Preparation.

Spiritus Myristicæ.—[Spirit of Nutmeg. *Synonym.*—Essence of Nutmeg. Oil of Nutmeg, 50; Alcohol, 950.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.]

[MACIS.

MACE.—The arillode of the seed of *Myristica fragrans* Houttuyn (nat. ord. *Myristicaceæ*). *Habitat.*—Molucca Islands; cultivated in the tropics.

CHARACTERS.—In narrow bands, 25 mm. or more long, somewhat branched and lobed above, united into broader bands below; brownish-orange; fatty when scratched or pressed; odor fragrant, taste warm and aromatic.

COMPOSITION.—The chief constituents are—(1) A Volatile Oil, 8 per cent., a greater portion of which is *Macene*, $C_{10}H_{16}$. (2) A Red fixed Oil. (3) Resin.

Dose, 5 to 20 gr.; .30 to 1.20 gm.]

ACTION AND THERAPEUTICS.

The action of oil of nutmeg is the same as that of other aromatic oils. Nutmegs [and mace] are much employed in

cookery for the sake of their volatile oil, which is an agreeable stomachic.

CINNAMOMUM.

[**CINNAMOMUM SAIGONICUM.**—Saigon Cinnamon. The bark of an undetermined species of *Cinnamomum* (nat. ord. *Laurineæ*). *Habitat.*—China.

CHARACTERS.—In quills about 15 cm. long, and 10 to 15 mm. in diameter, the bark 2 or 3 mm. thick; outer surface gray or light grayish-brown with whitish patches, more or less rough from numerous warts and some transverse ridges and fine longitudinal wrinkles; the inner surface cinnamon-brown or dark brown, granular and slightly striate; fracture short, granular, in the outer layer cinnamon-colored, having near the cork numerous whitish striæ forming an almost uninterrupted line; odor fragrant; taste sweet, warmly aromatic, somewhat astringent.

CINNAMOMUM ZEYLANICUM.—Ceylon Cinnamon. The inner bark of the shoots of *Cinnamomum zeylanicum* Breyne (nat. ord. *Laurineæ*). *Habitat.*—Ceylon; cultivated.

CHARACTERS.—Long, closely rolled quills, composed of eight or more layers of bark of the thickness of paper; pale yellowish-brown; outer surface smooth, marked with wavy lines of bast-bundles; inner surface striate; fracture short-splintery; odor fragrant; taste sweet and warmly aromatic.

COMPOSITION.—The chief constituents are—(1) A volatile oil, ½ to 1½ per cent. (2) Tannin. (3) Sugar. (4) Mannit.]

IMPURITY.—Cassia Bark.

Preparations.

[1. **Pulvis Aromaticus.**—Aromatic Powder. Ceylon Cinnamon, 35; Cardamom, 15; Ginger, 35; Nutmeg, 15.

Aromatic Powder is used to make Extractum Aromaticum Fluidum.

Dose, 10 to 30 gr.; .60 to 2.00 gm.

2. **Tinctura Cinnamomi.**—Tincture of Cinnamon. Ceylon Cinnamon, 100; Glycerin, 50; Alcohol and water to 1000. By percolation.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

3. **Extractum Aromaticum Fluidum.**—Aromatic Fluid Extract. Aromatic Powder, by maceration and percolation with Alcohol, and evaporation.

Dose, 10 to 30 m.; .60 to 2.00 c.c.]

[**CINNAMOMUM CASSIA.**—Cassia Cinnamon. *Synonym.*—Cassia Bark. The bark of the shoots of one or more undetermined species of *Cinnamomum* grown in China (Chinese Cinnamon) (nat. ord. *Laurineæ*). *Habitat.*—China.

CHARACTERS.—In quills of varying length and about 1 mm. or more in thickness; nearly deprived of the corky layer; yellowish-brown; outer surface somewhat rough; fracture nearly smooth; odor fragrant; taste sweet, and warmly aromatic.

COMPOSITION.—(1) Volatile Oil (*see* below). (2) Tannin. (3) Sugar. (4) Mannit.

Cassia Cinnamon is contained in Tinctura Cardamomi Composita, Tinctura Catechu Composita, Tinctura Lavandulæ Composita and Vinum Opii.]

OLEUM CINNAMOMI.—[Oil of Cinnamon. *Synonym.*—Oil of Cassia. A volatile oil distilled from Cassia Cinnamon.

CHARACTERS.—A yellowish or brownish liquid, becoming darker and thicker by age and exposure to the air, having the characteristic odor of Cinnamon, and a sweetish, spicy, and burning taste. Sp. gr., 1.055 to 1.065. *Solubility.*—In an equal volume of Alcohol.]

COMPOSITION.—The chief constituents are—(1) Chiefly *Cinnamic Aldehyde*, C_9H_8O. (2) In old oil, *Cinnamic Acid*, $C_9H_8O_2$.

Oil of Cinnamon is contained in Acidum Sulphuricum Aromaticum.

Dose, 1 to 5 m.; .06 to .30 c.c.

Preparations.

[1. **Aqua Cinnamomi.**—Cinnamon Water. Oil of Cinnamon, 2; by trituration with precipitated Calcium Phosphate and addition of distilled water to 1000.

Cinnamon Water is contained in Infusum Digitalis.

Dose, ½ to 1 fl. oz.; 15. to 30. c.c.

2. **Spiritus Cinnamomi.**—Spirit of Cinnamon. Oil of Cinnamon, 100; Alcohol, 900.

Dose, 10 to 30 m.; .60 to 2.00 c.c.]

ACTION AND THERAPEUTICS.

Oil of cinnamon has the same action as other aromatic volatile oils, and is therefore stomachic and carminative. Cinnamon bark in addition has, in virtue of its tannic acid, some astringent action, and is consequently a common flavoring stomachic vehicle for astringent powders and mixtures, except such as contain iron.

CAPSICUM.

CAPSICUM. [*Synonyms.*—Cayenne Pepper. African Pepper. The fruit of *Capsicum fastigiatum* Blume (nat. ord. *Solanaceæ*). *Habitat.*—Tropical America; cultivated in tropical countries.

CARDAMOMUM.

CARDAMOM.—The [fruit of *Elettaria repens* (Sonnrat) Baillon (nat. ord. *Scitamineæ*). *Habitat*—Malabar; cultivated in India.

CHARACTERS.—Ovoid or oblong, from 10 to 15 mm. long, obtusely triangular, rounded at the base, beaked, longitudinally striate; of a pale buff color, three-celled, with a thin, leathery, nearly tasteless pericarp, and a central placenta. The seeds are about 4 mm. long, reddish-brown, angular, rugose, depressed at the hilum, surrounded by a thin, membranous arillus, and have an agreeable odor and a pungent, aromatic taste.]

COMPOSITION.—The chief constituents are—(1) A volatile oil, 4 to 5 per cent., which is a terpene, $C_{10}H_{16}$. (2) A fixed oil, 10 to 11 per cent. The pericarp is medicinally inactive.

Cardamom is contained in Extractum Colocynthidis Compositum, Tinctura Gentianæ Composita, Pulvis Aromaticus, Tinctura Gentianæ Composita, Tinctura Rhei, and Tinctura Rhei [Dulcis].

Dose, 10 to 15 gr.; [.60 to 1.00 gm.]

Preparations.

[1. **Tinctura Cardamomi.**—Tincture of Cardamom. Cardamom, 100. By maceration and percolation with diluted Alcohol to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

2. **Tinctura Cardamomi Composita.**—Compound Tincture of Cardamom. Cardamom, 20; Caraway, 10; Cassia Cinnamon, 20; Cochineal, 5; Glycerin, 50. By percolation with diluted Alcohol to 1000.

Dose, 2 to 4 fl. dr.; 8. to 15. c.c.]

ACTION AND THERAPEUTICS.

Cardamom, because of its volatile oil, acts like cloves or pepper; therefore it is carminative and stomachic. As it has a pleasant taste, and the tincture is of a red color, it is much used as a coloring and flavoring agent. A good flavoring carminative is the Tinctura Carminativa of the Brit. Pharm. Conference. It contains cardamom, 6; strong tincture of ginger, 6; oil of cinnamon, oil of caraway, oil of cloves, of each 1; rectified spirit to 96. Dose, 2 to 10 minims [.12 to .60 c.c.].

SUMBUL.

SUMBUL.—*Synonym*—Musk Root. The root [of *Ferula Sumbul* (Kauffmann) Hooker filius (nat. ord. *Umbelliferæ*). *Habitat.*—Central and Northeastern Asia.

CHARACTERS.—In transverse segments, varying in diameter from about 2 to 7 cm., and in length from 15 to 30 mm.; light, spongy, annulate or longitudinally wrinkled; bark thin, brown, more or less bristly fibrous; the interior whitish, with numerous brownish-yellow resin-dots and irregular, easily separated fibres; odor strong, musk-like; taste bitter and balsamic.]

COMPOSITION.—The chief constituents are—(1) A volatile oil. (2) Two Resins. (3) *Valerianic Acid.* (4) *Sumbulic* or *Angelic Acid.*

Preparation.

Tinctura Sumbul. [Tincture of Sumbul. Sumbul, 100; by maceration and percolation with Alcohol and water, to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

ACTION AND THERAPEUTICS.

The action of sumbul is the same as that of volatile oils in general. It is only used internally, and is given as a carminative in flatulence. It is also employed in much the same class of cases as valerian—that is to say, in neurotic conditions, hysteria, etc. In Russia it is given chiefly as a stimulant in typhoid fever, dysentery, diarrhœa, etc., for the same purposes as musk is employed in many other countries.

OLEUM LAVANDULÆ [FLORUM].

OIL OF LAVENDER [FLOWERS.—A volatile oil distilled from the fresh flowers of *Lavandula officinalis* Chaix (nat. ord. *Labiatæ*). *Habitat.*—Southern Europe; cultivated.

CHARACTERS.—A colorless or yellowish liquid, having the fragrant odor of Lavender Flowers, and a pungent and bitter taste. Sp. gr., 0.885 to 0.897. *Solubility.*—In all proportions in Alcohol.]

COMPOSITION.—The chief constituents are—(1) Terpene. (2) Stearopten.

[*Oil of Lavender Flowers is contained in* Linimentum Saponis Mollis, Spiritus Ammoniæ Aromaticus, and Unguentum Diachylon.

Dose, 1 to 5 m.; .06 to .30 c.c.]

Preparations.

1. **Spiritus Lavandulæ.**—[Spirit of Lavender. Oil of Lavender Flowers, 50; deodorized Alcohol, 950.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.]

2. **Tinctura Lavandulæ Composita.**—[Compound Tincture of Lavander. *Synonym.*—Compound Spirit of Lavender. Oil of Lavender Flowers, 8; Oil of Rosemary, 2; Cassia Cinnamon, 20; Cloves,

5: Nutmeg, 100; Red Sandalwood, 100; Alcohol, 700; water, 250; diluted Alcohol to 1000. By mixing and percolation.]

Compound Tincture of Lavender is contained in Liquor [Potassii Arsenitis].

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.]

Action and Therapeutics.

Lavender, especially in the form of the compound tincture, makes a very agreeable gastric stimulant, carminative and coloring agent.

[OLEUM BERGAMOTTÆ.

OIL OF BERGAMOT.—*Synonym.*—Oleum Bergamii. A volatile oil obtained by expression from the rind of the fresh fruit of *Citrus Bergamia* Risso et Poiteau (nat. ord. *Rutaceæ*). *Habitat.*—Sicily; naturalized in subtropical countries.

Characters.—A greenish or greenish-yellow, thin liquid, having a peculiar, very fragrant odor, and an aromatic, bitter taste. Sp. gr., 0.880 to 0.887. *Solubility.*—In Alcohol and in Glacial Acetic Acid.

Composition.—By fractional distillation is obtained—(1) *Limonine*. (2) Dipentene $C_{10}H_{16}$. (3) *Linalyl*, $C_{10}H_{18}O$, 25 per cent. (4) Linalyl acetate, $C_{12}H_{20}O_2$, about 40 per cent., and to which the odor is probably due.

Action and Uses.

Although possessed of the excitant properties of volatile oils in general, it is used chiefly, if not exclusively, as a perfume].

MENTHA PIPERITA.

PEPPERMINT.—The leaves and tops of *Mentha piperita* Smith (nat. ord. Labiatæ). *Habitat.*—Wild in South Europe and North America; cultivated.

Characters.—Leaves about 5 cm. long, petiolate, ovate-lanceolate, acute, sharply serrate; glandular hairs numerous, the few hairs containing crystals of menthol; upper surface dark green; lower surface paler, reticulate-nerved, often purplish; flowers in terminal, cylindrical spikes, with a tubular, four-toothed, often purplish, calyx and a purplish corolla; the four short stamens; odor aromatic; taste aromatic, cooling.

Constituents.—The drug contains about 1 % volatile oil, (see below); a bitter principle, Mentha[illegible].

Preparations.

[illegible] Mentha Piperitæ.—Spirit of Peppermint. Synonym.

—Essence of Peppermint. Oil of Peppermint, 100; Peppermint, 10. By maceration and percolation with Alcohol to 1000.

Spirit of Peppermint is contained in Mistura Rhei et Sodæ.

Dose, 5 to 15 m.; .30 to 1.00 c.c.

OLEUM MENTHÆ PIPERITÆ.]—Oil of Peppermint. [A volatile oil distilled from Peppermint.

CHARACTERS.—A colorless, or yellowish, or greenish-yellow liquid, becoming darker and thicker by age and exposure to the air, having the characteristic, strong odor of Peppermint, and a strongly aromatic, pungent taste, followed by a sensation of cold when air is drawn into the mouth. Sp. gr., 0.900 to 0.920.

COMPOSITION.—The chief constituents are—(1) *Menthene*, $C_{10}H_{18}$, the liquid Terpene obtained by distillation]. (2) *Menthol*, the solid Stearopten (*q. v.*).

Oil of Peppermint is contained in Pilulæ Rhei Compositæ.

Dose, 1 to 5 m.; [.06 to .30 c.c.]

Preparations.

1. **Aqua Menthæ Piperitæ.**—[Peppermint water. Oil of Peppermint, 2. By trituration with precipitated Calcium Phosphate, and filtration with distilled water to 1000.

Dose, ½ to 2 fl. oz.; 15. to 60. c.c.

2. **Spiritus Menthæ Piperitæ.**—*See* above.

3. **Trochisci Menthæ Piperitæ.**—Troches of Peppermint. Oil of Peppermint, 1; Sugar, 80 gm.; Mucilage of Tragacanth to make 100 troches.

Dose, Freely.]

ACTION AND THERAPEUTICS.

The action of oil of peppermint is the same as that of volatile oils generally, but the cool, numb feeling often produced by volatile oils after the sensation has passed off is especially well marked with oil of peppermint; and this effect, which is due to the menthol in it, has caused it to be applied externally in neuralgia. Like many other volatile oils it is a powerful antiseptic.

Internally it is a powerful stomachic and carminative, is often used as such, and also as a flavoring agent.

MENTHA VIRIDIS.

[**SPEARMINT.**—The leaves and tops of *Mentha viridis* Linné (nat. ord. *Labiatæ*). *Habitat.*—Wild in Europe and North America; cultivated.

CHARACTERS.—Leaves about 5 cm. long, subsessile, lance-ovate, acute, serrate, glandular, nearly smooth; branches quadrangular, most light green; flowers in terminal, interrupted, narrow, acute spikes, with a tubular, sharply five-toothed calyx, a light purplish, four-lobed corolla, and four rather long stamens; odor aromatic, taste pungent.

COMPOSITION.—(1) A volatile oil (*see* below). (2) Resin. (3) Gum.

Preparation.

Spiritus Menthæ Viridis.—Spirit of Spearmint. *Synonym.*—Essence of Spearmint. Oil of Spearmint, 100; Spearmint, 10. By maceration with Alcohol and filtration to 1000.]

Dose, 5 to 15 m.; [.30 to 1.00 c.c.]

OLEUM MENTHÆ VIRIDIS.—[Oil of Spearmint. A volatile oil distilled from Spearmint.

CHARACTERS.—A colorless, yellowish, or greenish-yellow liquid, becoming darker and thicker by age and exposure to the air, having the characteristic, strong odor of Spearmint, and a hot, aromatic taste. Sp. gr., 0.930 to 0.940. *Solubility.*—Freely in Alcohol.]

COMPOSITION.—The chief constituents are—(1) *Menthene*, the same terpene as in Peppermint. (2) *Car[v]ol*, $C_{10}H_{14}O$, a stearopten isomeric with Thymol (*q. v.*).

Dose, 1 to 5 m.; [.06 to .30 c.c.]

Preparations.

1. **Aqua Menthæ Viridis.**—[Spearmint water. Oil of Spearmint, 2. By trituration with precipitated Calcium Phosphate, addition of distilled water and filtration to 1000.

Dose, ½ to 2 fl. oz.; 15. to 60. c.c.]

2. **Spiritus Menthæ Viridis.** (*See* above).

ACTION AND THERAPEUTICS.

These are the same as those of oil of peppermint, but oil of spearmint is not so agreeable.

ANISUM.

ANISE.—The [fruit of *Pimpinella Anisum* Linné (nat. ord. *Umbelliferæ*). *Habitat.*—Western Asia, Egypt, Southeastern Europe; cultivated.

CHARACTERS.—About 4 or 5 mm. long, ovate, compressed at the sides, grayish, finely hairy, and consisting of two mericarps, each with a flat face, and five light, brownish, filiform ridges, and about 15 thin oil tubes, which can be seen in a transverse section by the microscope. It has an agreeable, aro-

sweet, spicy taste.] *Resembling Anise.*—Conium, which smooth, grooved upon the face, and having crenate ridges ...een them, and no oil-tubes.

...N.—The chief constituent is the official *volatile oil* (*see* below). ...*ntained in* Tinctura Rhei Dulcis.

10 to 30 gr.; [.60 to 2.00 gm.]

...ICIUM. [*Synonym.*—Star Anise. The fruit of *Illicium verum* ...r filius (nat. ord. *Magnoliaceæ*). *Habitat.*—Northern Anam.

CHARACTERS.—The fruit is pedunculate and consists of eight stellately arranged carpels, which are boat-shaped, about 10 mm. long, rather woody, wrinkled, straight-beaked, brown, dehiscent on the upper suture, internally reddish-brown, glossy, and containing a single, flattish, oval, glossy, brownish-yellow seed; odor anise-like; taste of the carpels sweet and aromatic, and of the seeds oily. *Resembling star anise.*—*Illicium anisatum* Linné (*Illicium religiosum* Siebold), the carpels of which are more woody, shrivelled, and have a thin, mostly curved beak, a faint, clove-like odor, and an unpleasant taste.

COMPOSITION.—The chief constituent is the volatile oil.

Oleum Anisi may be distilled from this as well as from *Pimpinella Anisum*.]

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

OLEUM ANISI.—[Oil of Anise. A volatile oil distilled from Anise.

CHARACTERS.—A colorless or pale yellow, thin, and strongly refractive liquid, having the characteristic odor of Anise, and a sweetish, mildly aromatic taste. That from the *Pimpinella Anisum* solidifies at 59° F. [15° C.]; that from *Illicium verum* (Star-anise) at about 50° F. [10° C.]. Sp. gr., about 0.980 to 0.990. *Solubility.*—In an equal volume of Alcohol.]

COMPOSITION.—The chief constituents are—(1) A terpene, [$C_{10}H_{16}$, in small quantity. (2) A stearopten, *anethol*, $C_{10}H_{12}O$, 80 per cent.

Oil of Anise is contained in Tinctura Opii Camphorata, Spiritus Aurantii Compositus, Syrupus Sarsaparillæ Compositus, and Trochisci Glycyrrhizæ et Opii.]

Dose, 1 to 5 m.; [.06 to .30 c.c.]

[*Preparations.*

1. **Aqua Anisi.**—Anise water. Oil of Anise, 2. By trituration with precipitated Calcium Phosphate, addition of water and filtration to 1000.

Dose, ½ to 1 fl. oz.; 8. to .30 c.c.

2. **Spiritus Anisi.**—Spirit of Anise. Oil of Anise, 100; Alcohol, 900.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.]

Action and Therapeutics.

The action of oil of anise is the same as that of aromatic oils generally. It is specially used to get rid of flatulence in children, and, on account of its slightly expectorant action, as a basis of cough mixtures.

CORIANDRUM.

CORIANDER.—The [fruit of *Coriandrum sativum* Linné (nat. ord. *Umbelliferæ*). *Habitat.*—Central Asia and Southern Europe; cultivated.

Characters.—Globular; about 4 mm. in diameter; crowned with the calyx-teeth and stylopod; brownish-yellow, with slight, longitudinal ridges; the two mericarps cohering, enclosing a lenticular cavity, and each furnished on the face with two oil tubes; odor and taste agreeably aromatic.]

Composition.—The chief constituent is the official *volatile oil* (*see* below).

Dose, 10 to 30 gr.; [.60 to 2.00 gm.]

OLEUM CORIANDRI.—[Oil of Coriander. A volatile oil distilled from Coriander.

Characters.—A colorless or slightly yellowish liquid, having the characteristic, aromatic odor of Coriander, and a warm, spicy taste. Sp. gr., 0.870 to 0.885.

Composition.—(1) *Dextropinene.* (2) *Coriandrol*, $C_{10}H_{18}O$. It is isomeric with Borneo Camphor (*q. v.*).]

Oil of Coriander is contained in Syrupus Sennæ, [Confectio Sennæ, and Spiritus Aurantii Compositus.]

Dose, 2 to 5 m.; [.12 to .30 c.c.]

Action and Therapeutics.

Oil of coriander has the same action as other volatile oils. It is chiefly used as a stomachic and carminative, and to disguise the taste of rhubarb and senna.

FŒNICULUM.

FENNEL.—The [fruit of *Fœniculum capillaceum* Gilibert (nat. ord. *Umbelliferæ*). *Habitat.*—Levant and Southern Europe; cultivated.

Characters.—Oblong, nearly cylindrical, slightly curved, from 4 to 8 mm. long, brownish or greenish-brown; readily separable into the two prominent mericarps, each with five light brown, obtuse ribs, four oil-tubes on the back, and two or four oil-tubes upon the flat face; odor and taste aromatic, anise-like.] *Resembling Fennel.*—Conium fruit (Fennel is larger and has prominent vittæ, [oil tubes]), Caraway and Anise fruits.

COMPOSITION.—The chief constituent is a volatile oil, [almost chemically] identical with Oil of Anise (*see* below).

Fennel is contained in Infusum Sennæ Compositum.

Dose, 15 to 30 gr.; [1. to 2. gm.

OLEUM FŒNICULI.—Oil of Fennel. A volatile oil distilled from Fennel.

CHARACTERS.—A colorless or pale yellowish liquid, having the characteristic, aromatic odor of Fennel, and a sweetish, mild, and spicy taste. Sp. gr., not less than 0.960. *Solubility.*—In an equal volume of Alcohol.

Oil of Fennel is contained in Spiritus Juniperi Compositus and Pulvis Glycyrrhizæ Compositus.

Dose, 1 to 5 m.; .06 to .30 c.c.

Preparation.

Aqua Fœniculi.—Fennel water. Oil of Fennel, 2. By trituration with precipitated Calcium Phosphate, addition of distilled water; and filtration to 1000.]

Dose, ¼ to 1 fl. oz.; [8. to 30. c.c.]

ACTION AND THERAPEUTICS.

The same as those of oil of anise or of coriander.

CARUM.

CARAWAY.—The [fruit of *Carum Carvi* Linné (nat. ord. *Umbelliferæ*). *Habitat.*—Central and Western Asia; cultivated.

CHARACTERS.—Oblong, laterally compressed, about 4 or 5 mm. long, usually separated into the two mericarps, which are curved, narrower at both ends, brown, with five yellowish, filiform ribs, and with six oil-tubes. Caraway has an agreeable odor, and a sweetish, spicy taste.] *Resembling Caraway.*—Conium and Fennel. Known by the small ridges and the spicy taste of Caraway.

COMPOSITION.—The chief constituent is the volatile oil (*see* below), [5 to 7 per cent.

Caraway is contained in Tinctura Cardamomi Composita.]

Dose, 15 to 30 gr.; [1. to 2. gm.]

OLEUM CARI.—[Oil of Caraway. A volatile oil distilled from Caraway.

CHARACTERS.—A colorless, or pale yellow, thin liquid, having the characteristic, aromatic odor of Caraway, and a mild, spicy taste. Sp. gr.: 0.910 to 0.920. *Solubility.*—In an equal volume of Alcohol.]

COMPOSITION.—The chief constituents are—(1) *Car[vene,* $C_{10}H_{16}$,] a Terpene. (2) *Car[v]ol,* $C_{10}H_{14}O$, isomeric with Thymol (*q. v.*).

[*Oil of Caraway is contained in* Spiritus Juniperi Compositus.]

Dose, 1 to 5 m.; [.06 to .30 c.c.]

ACTION AND THERAPEUTICS.

The action and uses of oil of caraway are the same as those of other aromatic volatile oils. It is employed as a carminative, stomachic and flavoring agent.

SAMBUCUS.

SAMBUCUS.—*Synonym.*—Elder. [The flowers of *Sambucus canadensis* Linné (nat. ord. *Caprifoliaceæ*). *Habitat.*—North America, west to the Rocky Mountains, in damp places.

CHARACTERS.—The flowers, when fresh, about 5 mm. broad, and after drying shrivelled; calyx superior, minutely five-toothed; corolla originally cream-colored, after drying pale brownish-yellow, wheel-shaped and five-lobed, with five stamens on the short tube; odor peculiar; taste sweetish, somewhat aromatic and bitterish.]

COMPOSITION.—The chief constituents are—(1) A resin. (2) Valerianic Acid. (3) A minute amount of a volatile oil.

Dose, ½ to 1 dr.; [2. to 4. gm.]

ACTION AND THERAPEUTICS.

Elder flowers are used to flavor medicines, and are gently stimulant and diaphoretic.

[HEDEOMA.

HEDEOMA. — *Synonym.* — Pennyroyal. The leaves and tops of *Hedeoma pulegioides* (Linné) Persoon (nat. ord. *Labiatæ*). *Habitat.*—North America, south to Georgia, and west to Dakota; in sandy fields.

CHARACTERS. — Leaves opposite, short-petioled, about 12 mm. long, oblong-ovate, obscurely serrate, glandular beneath; branches roundish-quadrangular, hairy; flowers in small, axillary cymules, with a tubular-ovoid, bilabiate and five-toothed calyx, and a pale blue, spotted, bilabiate corolla, containing two sterile and two fertile, exserted stamens; odor strong, mint-like; taste warm and pungent.

COMPOSITION.—The chief constituent is the official volatile oil.

OLEUM HEDEOMÆ.—Oil of Hedeoma. *Synonym.*—Oil of Pennyroyal. A volatile oil distilled from Hedeoma.

CHARACTERS.—A pale yellowish, limpid liquid, having a characteristic, pungent, mint-like odor and taste. Sp. gr., 0.930 to 0.940. *Solubility.*—Freely in Alcohol.

Dose, 1 to 5 m.; .06 to .30 c.c.

ACTION AND USES.

Pennyroyal is a gentle aromatic stimulant, and may be given in flatulent colic and sick stomach.

ABSINTHIUM.

ABSINTHIUM. *Synonym.*—Wormwood. The leaves and tops of *Artemisia Absinthium* Linné (nat. ord. *Compositæ*). *Habitat.*—Northern Asia, Europe and Northern Africa; naturalized in North America; cultivated.

CHARACTERS.—Leaves about 5 cm. long, hoary, silky-pubescent, petiolate, roundish-triangular in outline; pinnately two- or three-cleft, with the segments lanceolate, the terminal one spatulate; bracts three-cleft or entire; heads numerous, about 3 mm. long, subglobose, with numerous small, pale yellow florets, all tubular and without pappus; odor aromatic; taste persistently bitter.

COMPOSITION.—The principal constituents are—(1) A volatile oil, about 1 per cent., mainly *Absinthol*, $C_{10}H_{16}O$. (2) A bitter glucoside, *Absinthin*, $C_{15}H_{20}O$. (3) *Absinthic Acid.* The volatile oil mixed with alcohol and oil of anise is known as absinthe.

Dose, 8 to 40 gr.; .50 to 2.40 gm.

USES.

Wormwood is used in an infusion as an aromatic tonic in atony of stomach or intestines.]

CLASS III.

Those used chiefly for their action on the heart and central nervous system.

VALERIANA.

VALERIAN.—The rhizome and roots of *Valeriana officinalis* [Linné (nat. ord. *Valerianeæ*). *Habitat.*—Europe and Northern Asia; naturalized in New England; cultivated.

CHARACTERS.—Rhizome from 2 to 4 cm. long, and 1 to 2 cm. thick, upright, subglobular or obconical, truncate at both ends, brown or yellowish-brown, internally whitish or pale brownish, with a narrow circle of white wood under the thin bark. Roots numerous, slender, brittle, brown, with a thick bark, and slender, ligneous cord. Odor peculiar, becoming stronger

and unpleasant on keeping; taste camphoraceous and somewhat bitter.] *Resembling Valerian.*—Serpentaria, Arnica, Green Hellebore; but Valerian is known by its odor.

COMPOSITION.—The chief constituents are—(1) *A volatile oil*, ½ to 2 per cent, [consisting of the alcohol, *Borneol*, $C_{10}H_{18}O$, its ether, $(C_{10}H_{17})_2O$, and its formic, acetic, and valerianic ethers.] (2) *Valerianic Acid*, $C_5H_{10}O_2$. It is colorless, oily, with the odor of Valerian, and strongly acid, with a burning taste. *Solubility.*—In 30 parts of water; readily in Alcohol and Ether. The amount of it in Valerian increases by keeping, while that of the oil decreases. It can be derived from Amylic Alcohol, $C_5H_{12}O$ (Valeryl Aldehyde). [(3) Formic, Acetic and Malic Acids. (4) Tannin. (5) Resin.

Dose, 10 to 30 gr.; .60 to 2.00 gm.]

Preparations.

1. **Extractum Valerianæ Fluidum.**—[Fluid Extract of Valerian. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 10 to 30 m.; .50 to 2.00 c.c.]

2. **Tinctura Valerianæ.**—[Tincture of Valerian. Valerian, 200; by maceration and percolation with Alcohol and water to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

3. **Tinctura Valerianæ Ammoniata.**—[Ammoniated Tincture of Valerian. Valerian, 200; by maceration and percolation with Aromatic Spirit of Ammonia to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

[AMMONII VALERIANAS.—Ammonium Valerianate. $NH_4C_5H_9O_2 = 118.78$.

SOURCE.—By saturating Valerianic Acid with Gaseous Ammonia, obtained from a mixture of Ammonium Chloride and Lime, and crystallization.

CHARACTERS.—Colorless, or white, quadrangular plates, emitting the odor of Valerianic Acid, of a sharp and sweetish taste, and deliquescent in moist air. *Solubility.*—Very soluble in water and in Alcohol; also soluble in Ether.

Dose, 2 to 8 gr.; .12 to .50 gm.

FERRI VALERIANAS.—Ferric Valerianate.

SOURCE.—By precipitating a diluted solution of Ferric Sulphate, with a solution of Sodium Valerianate and washing the precipitate.

CHARACTERS.—A dark, brick-red, amorphous powder of somewhat varying chemical composition, having the odor of Valerianic Acid, and a mildly styptic taste; permanent in dry air. *Solubility.*—Insoluble in cold water, but readily soluble in Alcohol.

Dose, 1 to 3 gr.; .06 to .20 gm.]

ZINCI VALERIANAS.—Zinc Valerianate. $Zn(C_5H_9O_2)_2[+2H_2O$ =302.56.

SOURCE.—From hot solutions of Zinc Sulphate and Sodium Valerianate, evaporate and Zinc Valerianate crystallizes out.

CHARACTERS.—White, pearly scales, having the odor of Valerianic Acid, and a sweetish, astringent and metallic taste. On exposure to the air it slowly loses Valerianic Acid. *Solubility.*—In about 100 parts of water, and in 40 parts of Alcohol.]

INCOMPATIBLES.—All acids, soluble carbonates, most metallic salts and vegetable astringents.

Dose, ½ to 3 gr.; [.03 to .20 gm.]

ACTION.

Neither Valerianic acid, [ammonium valerianate, ferric valerianate] nor zinc valerianate are known to have any action [although their extensive use warrants the belief that they are valuable remedies.]

Valerian itself acts in virtue of its volatile oil, which has the same properties as other volatile oils. Valerian is therefore an irritant when applied externally; internally it stimulates the mouth, stomach, and intestines; consequently it increases the appetite and the vascularity, the secretion, and the peristaltic action of the stomach and intestines; and in its excretion, which takes place chiefly through the bronchial mucous membrane, kidneys, and genito-urinary mucous membrane, it excites the flow of fluids excreted through these parts. Acting reflexly from the stomach, it stimulates the circulation rather more powerfully than most volatile oils.

THERAPEUTICS.

Preparations of valerian, or still better the oil (2 to 5 minims [.12 to. 30 c.c.]) suspended in mucilage with cinnamon water, are often given as carminatives in cases of flatulence, and as reflex stimulants in fainting, palpitation, etc. Valerian and [the] valerianates sometimes cure reflex neuralgia, and they are often prescribed for hysteria and other neurotic conditions, but frequently without benefit.

[CYPRIPEDIUM.

CYPRIPEDIUM.—*Synonym.*—Ladies' Slipper. The rhizome and roots of *Cypripedium pubescens* Swartz, and of *Cypripedium parviflorum* Salisbury (nat. ord. *Orchidæ*). *Habitat.*—North America; in swampy places.

CHARACTERS.—Of horizontal growth, bent, 10 cm., or less, long; from 3 to 5 mm. thick; on the upper side beset with numerous circular, cup-shaped scars; closely covered below with simple, wiry roots, varying from 10 to 15 cm. in length; brittle, dark brown, or orange-brown; fracture short, white; odor peculiar, heavy; taste sweetish, bitter, and somewhat pungent.

COMPOSITION.—It contains—(1) A volatile oil. (2) A volatile acid. (3) Two resins. (4) Tannin.

Dose, 15 to 30 gr.; 1. to 2. gm.

Preparation.

Extractum Cypripedii Fluidum.—Fluid Extract of Cypripedium. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 15 to 30 m.; 1. to 2. c.c.

ACTION AND USES.

Cypripedium is a gentle, nervous stimulant, resembling Valerian in its action. It has been used for nervous diseases, epilepsy, hypochondriasis and neuralgia.]

ASAFŒTIDA.

ASAFETIDA.—A gum-resin obtained [from the root of *Ferula fœtida* (Bunge) Regel (nat. ord. *Umbelliferæ*). *Habitat.*—Persia, Turkestan and Afghanistan.

CHARACTERS.—In irregular masses composed of whitish tears, which are imbedded in a yellowish-gray or brownish-gray, sticky mass. The tears, when hard, break with a conchoidal fracture, showing a milk-white color, which changes gradually, on exposure, to pink, and finally to brown. It has a persistent, alliaceous odor and a bitter, alliaceous, acrid taste. *Solubility.*—Partly in Ether and Alcohol.] *Resembling Asafetida.*—Galbanum, Ammoniacum, and Benzoin, distinguished by their peculiar odors, which differ markedly from that of Asafetida.

COMPOSITION.—The chief constituents are—(1) *A volatile oil*, 3 to 9 per cent., the most important ingredient of which is the Oil of Garlic, (*see* p. 388), Allyl (C_3H_5) oxide and sulphide. This gives Asafetida its very unpleasant odor. (2) Gum, 20 to 30 per cent. (3) Resin, 45 to 70 per cent., which contains (4) Ferulaic Acid, $C_{10}H_{10}O_4$.

IMPURITIES.—Earthy matter [or Calcium Sulphate and Carbonate, and sand.]

Preparations.

1. [**Emulsum Asafœtidæ.**—Emulsion of Asafetida. *Synonyms.*—Mistura Asafœtidæ. Milk of Asafetida. Asafetida, 40; by rubbing in a warmed mortar with water, and straining to 1000.

Dose, ½ to 1 fl. oz.; 15. to 30. c.c.]

2. **Pilulæ Aloes et Asafœtidæ.** *See* Aloes, p. 429.

3. **Pilulæ Asafœtidæ.**—Pills of Asafetida. Asafetida, 20; Soap, 60 gm.; to make 100 pills. Each pill contains 3 gr.; .20 gm. of Asafetida.

Dose, 1 to 4 pills.

4. **Tinctura Asafœtidæ.**—Tincture of Asafetida. Asafetida, 200. By maceration with Alcohol, and filtration to 1000.

Dose, ½ to 1 fl. dr.; [2. to 4. c.c.]

ACTION.

Both internally and externally, asafetida, in virtue of its volatile oil, acts like volatile oils generally. Its action as a stimulant to the intestinal muscle is especially well marked, hence it is combined with aloes in Pilulæ Aloes et Asafœtidæ; and the enema, [1 to 16] of water, will relieve flatus. Owing to its containing allyl oxide and sulphide it is extremely [unpleasant], and therefore it is not, like many volatile oils, available as a condiment. Its taste is credited with some mental effect in cases of hysteria.

THERAPEUTICS.

Asafetida is not used externally. Internally it is prescribed to aid the action of other purgatives, and also to stimulate the muscular coat to expel flatus. It may be given by the mouth or as the enema. Partly on account of its reflex stimulating effect, but also on account of its very [unpleasant] taste, it is used to control hysteria, emotional, and other mental disturbances, but it often fails. For this purpose it may be combined with valerian. Cases of malingering may sometimes be cured by making the patient take, three times a day, an effervescing draught containing a few minims of each of the tinctures of valerian and asafe-

tida. The effervescence makes the [unpleasant] taste of these medicines "repeat" in the mouth for some time after taking them. Asafetida oil would in the course of its excretion disinfect the urine and the expectoration, but its smell forbids its use for these purposes.

AMMONIACUM.

AMMONIAC.—A Gum Resin [obtained from *Dorema Ammoniacum* Don (nat. ord. *Umbelliferæ.*) *Habitat.*—Eastern Persia and Turkestan.

CHARACTERS.—In roundish tears, from 2 to 6 mm. or more in diameter; externally pale yellowish-brown, internally milk-white, brittle when cold, and breaking with a flat, conchoidal, and waxy fracture; or the tears are superficially united into irregular masses without any intervening, dark-colored substance. It has a peculiar odor, and a bitter, acrid and nauseous taste.] *Resembling Ammoniacum.*—Asafœtida, Galbanum, Benzoin, known by their odor.

COMPOSITION.—The chief ingredients are—(1) Volatile oil, 1½ to 4 per cent. (2) Resin, 70 per cent. (3) Gum, 18 to 28 per cent.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparations.

1. **Emplastrum Ammoniaci cum Hydrargyro.**—[*See* Mercury, p. 192.

2. **Emulsum Ammoniaci.**—Emulsion of Ammoniac. Ammoniac, 40; water added gradually to 1000. It forms a milk-like emulsion.

Dose, ½ to 1 fl. oz.; .15 to .30 c.c.]

ACTION AND THERAPEUTICS.

The action of ammoniacum is precisely the same as that of volatile oils generally. It is employed externally to aid, by its mildly irritating effects, the absorption of chronic inflammatory products, and internally in chronic bronchitis with offensive expectoration for the sake of the remote disinfectant expectorant effect that it has, in the course of its excretion through the bronchial mucous membrane.

MYRRHA.

MYRRH.—A gum-resin [obtained from *Commiphora Myrrha* (Nees) Engler (nat. ord. *Burseraceæ*). *Habitat.*—Eastern Africa and Southwestern Arabia.

CHARACTERS.—In roundish or irregular tears or masses, brownish-yellow or reddish-brown; fracture waxy, somewhat splintery, translucent on the edges, sometimes marked with whitish veins; odor balsamic; taste aromatic, bitter and acrid.]

COMPOSITION.—The chief constituents are—(1) *Myrrhin*, [$C_{48}H_{32}O_{10}$.] a resin, 25 to 40 per cent. (2) *Myrrhol*, $C_{10}H_{14}O$, a volatile oil, 2 [to 4] per cent. (3) Gum, 40 to 60 per cent. (4) A bitter principle.

IMPURITIES.—Many varieties of gum and gum-resins.

Myrrh is contained in Mistura Ferri Composita and Pilulæ Rhei Compositæ.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparations.

1. **Tinctura Myrrhæ.**—[Tincture of Myrrh. Myrrh, 200; by maceration with Alcohol and filtration to 1000.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

2. **Tinctura Aloes et Myrrhæ.** *See* Aloes, p. 430.

3. **Pilulæ Aloes et Myrrhæ.** *See* Aloes, p. 429.]

ACTION.

External.—Both externally and internally, myrrh has the same action as other substances containing a volatile oil. It is a mild disinfectant, and a stimulant to sores and ulcers.

Internal.—It has the same effects in the mouth. It is a **stomachic carminative,** exciting the appetite, the flow of gastric juice, and the vascularity and peristalsis of the stomach and intestines. The number of leucocytes in the blood is said to be increased by the administration of myrrh. It is excreted by mucous membranes, especially the genito-urinary and the bronchial, and it stimulates and disinfects their secretions in its passage through them. Thus it becomes an expectorant, a uterine stimulant, and an emmenagogue.

THERAPEUTICS.

External.—Occasionally myrrh has been employed as a stimulant to **sores and ulcers.**

Internal.—**It is, in the form of the** tincture diffused through water [1 to 16], **used as a mouth-wash and** gargle for sore spongy

gums, relaxed throat, and other similar conditions, for which it is often combined with borax, as in the following formula:—Myrrh, 1; eau de Cologne, 16; borax, 1; water, 3; syrup, 3. It is frequently given with purgatives for the sake of its carminative and stomachic properties. It is also commonly combined with iron when this drug is given for anæmia, but the reason for this is not clear. It is prescribed for amenorrhœa, and has been given for cystitis, and as a disinfectant expectorant for chronic bronchitis.

CLASS IV.

Those used chiefly for their action on the bronchial mucous membrane.

BALSAMUM PERUVIANUM.

BALSAM OF PERU.—A balsam [obtained from *Toluifera Pereiræ* (Royle) Baillon (nat. ord. *Leguminosæ*). *Habitat.*—Central America.

CHARACTERS.—A liquid having a syrupy consistence, free from stringiness or stickiness, of a brownish-black color in bulk, reddish brown and transparent in thin layers, of an agreeable vanilla-like, somewhat smoky odor, and a bitter taste, leaving a persistent after-taste. On exposure to air it does not become hard. Sp. gr., 1.135 to 1.150. *Solubility.*—Miscible, in all proportions, with absolute Alcohol, Chloroform, or Glacial Acetic Acid; only partially soluble in Ether or Benzin. It is completely soluble in 5 parts of Alcohol.]

COMPOSITION.—The chief constituents are—(1) A volatile oil. This is present in large quantities; it consists of *Cinnam[ein* (Benzylic Cinnamate), $C_9H_7(C_7H_7)O_2$, about 60 per cent. (2) *Cinnamic Acid*, $C_9H_8O_2$. (3) Resin, about 32 per cent., which on dry distillation yields *Benzoic Acid*, $HC_7H_5O_2$. Small quantities of (4) Benzylic Benzoate, $C_7H_5(C_7H_7)O_2$, (5) Benzyl Alcohol, C_7H_8O, (6) Stilbene, $C_{14}H_{12}$, (7) Styrol, C_8H_8, and (8) Styracin.

IMPURITIES.—Fixed oils, resins, oleoresins and alcohol.]

Dose, 10 to 30 m.; [.60 to 2.00 c.c.]

ACTION AND THERAPEUTICS.

External.—Like most substances containing a volatile oil, balm of Peru is a disinfectant, and also a stimulant when rubbed into the skin or applied to raw surfaces. Formerly it was much used for these purposes, chiefly as an application to indolent sores and chronic eczema. A mixture of balsam of Peru, 1 part; lard, 7 parts; is very useful for sore nipples and cracked lips. Now it

is not often employed externally except as antiparasitic for pediculi, scabies and ringworm. An ointment consisting of balsam of Peru, 20; olive oil, 50; [petrolatum], 100; may be used. For scabies it should be applied in the way already described for sulphur ointment. It is a more agreeable preparation.

Internal.—Like most volatile oils it is carminative and stomachic, and after absorption is excreted by, and stimulates and disinfects the mucous membranes. For this reason it is used as an **expectorant** in chronic bronchitis. It is also excreted by the skin and the kidneys.

BALSAMUM TOLUTANUM.

BALSAM OF TOLU.—A balsam [obtained from *Toluifera Balsamum* Linné (nat. ord. *Leguminosæ*). *Habitat.*—Venezuela and New Granada.

CHARACTERS.—A yellowish-brown, semi-fluid or nearly solid mass, becoming more brittle when exposed to cold, transparent in thin layers, having an agreeable odor recalling that of Vanilla, but distinct from it, and a mild, aromatic taste. *Solubility.*—Readily and completely soluble in Alcohol. Also completely soluble in Chloroform, and in solutions of the fixed alkalies; almost completely soluble in Ether, but nearly insoluble in water, Benzin, or Carbon Disulphide.]

COMPOSITION.—The chief constituents are—(1) *Tolene*, $C_{10}H_{16}$, [1 per cent., a thin, colorless, aromatic oil. (2) *Benzylic Benzoate*, $C_7H_5(C_7H_7)O_2$, a colorless, aromatic oil. (3) *Benzylic Cinnamate*, $C_9H_7(C_7H_7)O_2$. (4) *Benzoic Acid*, $HC_7H_5O_2$. (5) *Cinnamic Acid*, $C_9H_8O_2$. (6) Resins.

IMPURITIES.—Turpentine, storax, sweet gum, and resins.

Balsam of Tolu is contained in Tinctura Benzoini Composita.

Dose, 10 to 30 m.; [.60 to 2.00 c.c.]

Preparations.

1. **Syrupus Tolutanus.**—[Syrup of Tolu. Balsam of Tolu, 10; Alcohol, 50; Precipitated Calcium Phosphate, 50; Sugar, 850; water to 1000. By solution and filtration.

Dose, ½ to 1 fl. oz.; 15. to 30. c.c.

2. **Tinctura Tolutana.**—Tincture of Tolu. Balsam of Tolu, 100. By maceration with Alcohol and filtration to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.]

ACTION AND THERAPEUTICS.

Although it has an action in all respects similar to that of

COMPOSITION.—The chief constituents are—(1) *mene*, a volatile oil. (2) *Cinnamic Acid*, $C_9H_8O_2$, c line; this can be oxidized to Benzoic Acid, is also fou sams of Tolu and Peru. (3) *Styracin*, or *Cinnamyl Ci* (4) *Phenylpropyl Cinnamate*, $C_9H_7(C_9H_{17})O_2$. (5) $(C_2H_5)O_2$. (6) *Storesin*, $C_{36}H_{56}O_3$, in considerable having a fragrant odor.]

Storax is contained in Tinctura Benzoini Compo

Dose, 5 to 20 gr.; [.30 to 1.20 gm.]

ACTION AND THERAPEUTI

Storax has the same action as balsams of Benzoin, and may be employed for the same often given internally except in the compo zoin. Mixed with an equal part of olive oi kill the [*Sarcoptes scabiei*] and pediculi.

CLASS V.

Those used chiefly for their action on the kidneys a

OLEUM JUNIPERI.

OIL OF JUNIPER.—A volatile oil distill *Juniperus communis* Linné (nat. ord. *Coniferæ*). *H* throughout Canada, the Northern United States, and south to New Mexico.

CHARACTERS.—A colorless or faintly

Preparations.

1. **Spiritus Juniperi.**—[Spirit of Juniper. Oil of Juniper, 50; Alcohol, 950.

Dose, 30 to 60 m.; 2. to 4. c.c.

2. **Spiritus Juniperi Compositus.**—Compound Spirit of Juniper. Oil of Juniper, 8; Oil of Caraway, 1; Oil of Fennel, 1; Alcohol, 1400; Water to 2000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

ACTION.

Oil of juniper has much the same action as oil of turpentine; but it is not so liable to upset the digestion; and although it is a powerful renal stimulant and **diuretic**, it does not easily cause hæmaturia and albuminuria.

THERAPEUTICS.

It is not used externally. Occasionally it is given as a pleasant carminative and stomachic, but its main use is as a diuretic in heart disease, hepatic ascites, and chronic Bright's disease. It certainly markedly increases the quantity of the urine, which it causes to smell like violets. As a constituent of Hollands and gin, these are good forms of alcohol for persons suffering from the above diseases.

BUCHU.

BUCHU. — *Synonym.* — Bucco. The leaves of *Barosma betulina* [(Thunberg) Bartling et Wendland, and *Barosma crenulata* (Linné) Hooker (nat. ord. *Rutaceæ*). *Habitat.*—Southern Africa.

CHARACTERS.—About 15 mm. long, roundish-obovate, with a rather wedge-shaped base, or varying between oval and obovate, obtuse, crenate or serrate, with a gland at the base of each tooth, dull yellowish-green, thickish, pellucid-punctate; odor and taste strongly aromatic, somewhat mint-like, pungent and bitterish.] *Resembling Buchu.*—Senna and Uva Ursi, which have entire leaves.

COMPOSITION.—The chief constituents are—(1) A volatile oil. [(2) A Stearopten (diosphenol, $C_{10}H_{16}O_2$)] in solution in a liquid hydrocarbon. The stearopten is deposited on exposure to air. (3) A [*glucoside Barosmin*, soluble in alcohol (scarcely so, if cold) and in ether, volatile oils, dilute acids and alkalies.] (4) [*Rutin*, a bitter principle. (5) Mucilage.

Dose, 15 to 30 gr.; 1. to 2. gm.]

volatile oil diffuses into the blood and
chial mucous membrane, which it stimul
fore occasionally given as an expector
excreted by the kidney, which is also sti
is a mild **diuretic.** In the process
peculiar odor to the urine, and acts as a
fectant to the urinary tract, especia
consequently been administered for cy
pyelitis, gonorrhœa, etc. Large doses co
are said to damage the kidney. The flui
well with water on account of the oil in
buchu is much the same as that of Pareira
take, and is a good vehicle for diuretics.

COPAIBA.

COPAIBA.—*Synonym.*—Balsam of Copaib
paiba Langsdorffii (Desfontaines) O. Kuntze, and
(nat. ord. *Leguminosæ*). *Habitat.*—Brazil, Venez

CHARACTERS.—A transparent or translucent, r
a pale yellow to brownish-yellow color, having a p
a bitter acrid taste. Sp. gr., 0.940 to 0.990. *Solu*
readily soluble in absolute Alcohol, Ether, Chlor
Benzin, and fixed and volatile oils.]

COMPOSITION.—The chief constituents are—
below). (2) *The Resin*, which exists dissolved i

Preparation.

[**Massa Copaibæ.**—Mass of Copaiba. *Synonym.*—Solidified Copaiba. Copaiba, 94; Magnesia, 6. By trituration with water, and heating.

Dose, ¼ to 1 dr.; 1. to 4. gm.]

OLEUM COPAIBÆ.—[Oil of Copaiba.]

SOURCE.—A volatile oil distilled from Copaiba.

CHARACTERS.—[A colorless or pale yellowish liquid, having the characteristic odor of Copaiba, and an aromatic, bitterish, and pungent taste. It is isomeric with Turpentine, $C_{10}H_{16}$. Sp. gr., 0.890 to 0.910. *Solubility.*—In about 10 times its volume of Alcohol.]

Dose, 5 to 15 m.; [.30 to 1.00 c.c.] suspended in Mucilage of Acacia (1½ fl. oz. [45. c.c.] for every fl. oz. [30. c.c.] of Oil of Copaiba) or yolk of egg. Cinnamon or Peppermint Water, with Tincture of Orange or Ginger, covers the taste. It may be dissolved in Alcohol and in water with the aid of Liquor Potassæ, with which it forms a soap, or it may be given in capsules.

[**RESINA COPAIBÆ.**—Resin of Copaiba. The residue left after distilling off the volatile oil from Copaiba.

CHARACTERS.—A yellowish or brownish-yellow, brittle resin, having a slight odor and taste of Copaiba. *Solubility.*—In Alcohol, Ether, Chloroform, Carbon Disulphide, Benzol, or Amylic Alcohol.

Dose, 5 to 15 gr.; .30 to 1.00 gm.]

ACTION.

External.—Copaiba is a stimulant to the skin.

Internal.—*Gastro-intestinal tract.*—It acts like other volatile oils. Small doses produce a feeling of warmth in the epigastrium; but with large doses its irritant effect leads to vomiting and diarrhœa. Its taste is [unpleasant], and the eructations it may cause are very disagreeable.

Mucous membranes.—Here also it acts like other volatile oils. It is quickly absorbed, and then is excreted by all the mucous membranes, which it stimulates in its passage through them, increasing their vascularity and the amount of their secretion, which, if foul, is disinfected. Because of these actions it is a disinfectant **expectorant**, and a stimulating **disinfectant** to the whole of the **genito-urinary tract.** It imparts a powerful odor to the breath and mucous secretions. It is also excreted by the skin,

4. Trochisci Cubebæ.—Troches c
4; Oil of Sassafras, 1; Extract of Gly
Syrup of Tolu, a sufficient quantity to m
contains ⅔ m.; .04 c.c., of the Oleoresi

Dose, 1 to 6 troches.

OLEUM CUBEBÆ.—Oil of Cubeb.
Cubeb.

CHARACTERS.—A colorless, [pale greenish
the characteristic odor of Cubeb, and a warm, ca
Sp. gr., about 0.920. *Solubility.*—Soluble in an

COMPOSITION.—The chief constituents are
$H_{26}O$,] a stearopten. (2) Two oils, $C_{15}H_{24}$.
Terpene.

Dose, 5 to 20 m.; [.30 to 1.20 c.c.] suspe

ACTION.

External.—Like other substances c
cubeb is rubefacient when rubbed into th

Internal.—Small doses are stomach
improve digestion, but moderate doses a
dyspepsia. Cubeb enters the blood, and,
slightly stimulates the heart, and also exc
which it is excreted. Occasionally, there
matous eruption on the skin; it increa
bronchial secretion, and is consequently a

THERAPEUTICS.

It is sometimes employed as [troches], or as a powder, or as the smoke of cubeb cigarettes, to stimulate the mucous membrane in cases of slight bronchitis, chronic sore throat, or follicular pharyngitis. Chronic nasal catarrh and hay-fever have been treated by insufflations of the powder. Asthma is sometimes relieved by the cigarettes. Many popular bronchial troches contain cubeb; in them it exercises its expectorant action. Cubeb is rarely used as a stomachic or cardiac stimulant, because it is so liable to upset digestion; but as it is less likely to do so than copaiba, is a little pleasanter to take, and is almost as powerful a stimulant to the genito-urinary mucous membrane; it is largely used in gleet, gonorrhœa, and chronic cystitis.

OLEUM SANTALI.

OIL OF SANTAL.—*Synonym.*—[Oil of Sandal Wood. A volatile oil distilled from the wood of *Santalum album* Linné (nat. ord. *Santalaceæ*). *Habitat.*—Southern India.

CHARACTERS.—A pale yellowish or yellow, somewhat thickish liquid, having a peculiar, strongly aromatic odor, and a pungent, spicy taste. Sp. gr., 0.970 to 0.978. It deviates polarized light to the left: distinction from *Australian* (Sp. gr., 0.953) and *West Indian* (Sp. gr., 0.965) *Sandal Wood Oil*, which deviate polarized light to the right. *Solubility.*—Readily in Alcohol.

COMPOSITION.—(1) *Santalol*, $C_{15}H_{26}O$. (2) *Santalal*, $C_{15}H_{24}O$.]

Dose, 2 to 10 m.; [.12 to .60 c.c.]

ACTION AND THERAPEUTICS.

The action of oil of santal is the same as that of volatile oils in general, but, like that of the oils of copaiba and cubeb, it is especially manifested in the **genito-urinary mucous membranes**, which are **stimulated and disinfected.** The drug is used in gonorrhœa and gleet; [it is best administered in capsules, or in an emulsion;] it is pleasanter than copaiba, but more expensive. It appears in the urine half an hour after administration. Some of it is excreted by the bronchial mucous membrane; it is, therefore, a stimulating disinfectant e rant. Two or three drops on sugar will frequently rel

cent. 2. A [illegible] resin. 3

(5) Tannin.

Dose, ½ **to** 2 **dr.**; [2. to 8.

[*Pr*

1. **Extractum Matico** .

maceration and percolation wi

Dose, ½ **to** 2 **fl. dr.**; 2.

2. **Tinctura Matico.**—

maceration and percolation with

Dose, ½ **to** 1 **fl. oz.**; 15.

ACTI

The volatile oil of matico pro
as that of cubeb, influencing chie
It has been given for the same c
leaves are sometimes placed upo
numerous hairs promote the clottin
are hæmostatic.

CLASS V

Those used chiefly for their action on

COMPOSITION.—The chief constituent is the *volatile oil* (*see* below), about 2 per cent.

Dose, 5 to 15 gr.; [.30 to 1.00 gm.

Preparation.

Extractum Sabinæ Fluidum.—Fluid Extract of Savine. By maceration and percolation with Alcohol, and evaporation.

Dose, 5 to 15 m.; .30 to 1.00 c.c.]

OLEUM SABINÆ.—[Oil of Savine.

SOURCE.—A volatile oil distilled from Savine.

CHARACTERS.—A colorless or yellowish liquid, having a peculiar terebinthinate odor, and a pungent, bitterish and camphoraceous taste. It becomes darker and thicker by age and exposure to the air. Sp. gr., 0.910 to 0.940. *Solubility.*—Soluble in equal volume of Alcohol.]

COMPOSITION.—It contains several terpenes.

Dose, 1 to 5 m.; [.06 to .30 c.c.]

ACTION.

Oil of savine has the same actions as oil of turpentine, but they are more marked. Thus externally it causes great redness, pain, vesication, and even pustulation. Internally it may produce severe gastro-intestinal irritation, with vomiting, abdominal pain and purging. In its excretion through the kidneys and the mucous membranes of the genito-urinary tract it severely irritates them; thus hæmaturia, scanty urine, and pain on micturition may follow its use. The point in which the action of oil of savine differs from that of the oil of turpentine is that it powerfully irritates the **ovaries and uterus,** causing hyperæmia of them and accelerating menstruation. It also induces contractions of the pregnant uterus, and therefore it is an **ecbolic.**

THERAPEUTICS.

The [cerate made from the fluid extract, 25 per cent. in resin cerate], has been used as a powerful irritant and counter-irritant, and internally savine may be given as an emmenagogue; but, on the whole, its use is to be discouraged, as it is so liable to cause serious gastro-enteritis. It has often been administered as an ecbolic with criminal intent.

.....rous yellow, tubular florets; and bitter.

COMPOSITION.—(1) *Tanacetin*, C_1 oil, ¼ per cent. (3) Tannin.

Dose, ¼ to 1 dr.; 1. to 4. gm.

USE

Tansy possesses the properties irritant narcotic. It has been u dangerous in large doses, several fat

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GROUP

Vegetable I

All these substances contain a bitter princi of the stom

Calumba, Calamus, Gentian, Quassia taria, Anthemis, Matricaria, C Orange Peel, Oil of C

CALUMI

CALUMBA.—[*Synonym.*—Columb (Lamarck) Miers (nat. ord. *Menispermace* tivated in some

acid, $C_{21}H_{22}O_6$. (4) Starch, 33 per cent. No Tannin is present, so Calumba can be prescribed with iron salts.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparations.

1. **Extractum Calumbæ [Fluidum.**—Fluid Extract of Calumba. By maceration and percolation in Alcohol and water and evaporation.]

Dose, 5 to 30 m.; [.30 to 2.00 c.c.]

2. **Tinctura Calumbæ.**—[Tincture of Calumba. Calumba, 100, by maceration and percolation in Alcohol and water to 1000.]

Dose, 1 to 4 fl. dr.; [4. to 15. c.c.]

Action.

External.—Calumba is a mild antiseptic and disinfectant.

Internal.—*Mouth.*—Calumba is a typical **bitter**; the appetite is sharpened because the gustatory nerves are stimulated; this reflexly leads to dilatation of the gastric vessels and to an increase in the gastric and salivary secretions.

Stomach.—The effects on the gastric mucous membrane which were brought about reflexly by the stimulation of the gustatory nerves are further exaggerated by the arrival of the saliva in the stomach, and by the direct action of the calumba on it. The result is to cause a feeling of hunger, an extra secretion of gastric juice and greater vascular dilatation, and all this **helps the digestion** of the food. Peristalsis in the stomach and intestine is made slightly more active, and thus calumba is **carminative.**

Injected [into] the rectum it is **anthelmintic,** destroying the threadworm.

Therapeutics.

Calumba is only employed to stimulate the gastric functions and improve the appetite in cases of chronic indigestion due to a general weakness of action on the part of the stomach. It is thus a type of the large class of stomachics. It is especially valuable in that form of **dyspepsia** in which the stomach participates in a general feebleness of all the organs of the body, such as we see in anæmia, starvation, convalescence from acute diseases, tuber-

tonics; all that is mea
tion of food more easy
bitters, when given as
patient is in the knee-cl
Oxyuris vermicularis.
of calumba may be throv

CALAMUS.—*Synonym.*
amus Linné (nat. ord. *Aroideæ*)
the banks of streams and ponds.

CHARACTERS.—In sections
broad, subcylindrical, longitudina
with leaf-scars forming triangles,
scars of the rootlets in wavy lines
late from remnants of leaf-sheat
breaking with a short, corky fracti
wood-bundles, the latter crowded
aromatic odor, and a strongly bitt

COMPOSITION.—The chief co
glucoside, as a syrupy, yellow liqu
Calamine, an alkaloid. (4) Cho

GENTIANA.

GENTIAN.—The root of *Gentiana lutea* [Linné (nat. ord. *Gentianeæ*). *Habitat.*—Mountains of Central and Southern Europe.

CHARACTERS.—In nearly cylindrical pieces or longitudinal slices, about 25 mm. thick, the upper portion closely annulate, the lower portion longitudinally wrinkled; externally deep yellowish-brown; internally lighter; somewhat flexible and tough when damp; rather brittle when dry; fracture uneven; the bark rather thick, separated from the somewhat spongy meditullium by a black cambium line; odor peculiar, faint, more prominent when moistened; taste sweetish and presistently bitter.]

COMPOSITION.—The chief constituents are—(1) *Gentiopicrin*, an active, very bitter glucoside, soluble in water and Alcohol. Can be split up into Glucose and Gentiogenin. (2) *Gentisic Acid*, [$C_{14}H_{10}O_5$, in yellow, tasteless needles,] united with Gentiopicrin. (3) A trace of a volatile oil. (4) Gum and Sugar. Gentian contains no Tannin, but cannot be prescribed with iron, because that darkens the coloring matter.

INCOMPATIBLES.—Iron sulphate, silver nitrate, and lead salts.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparations.

1. **Extractum Gentianæ.**—[Extract of Gentian. By maceration and percolation with water and evaporation.

Dose, 2 to 10 gr.; .12 to .60 gm.

2. **Extractum Gentianæ Fluidum.**—Fluid Extract of Gentian. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

3. **Tinctura Gentianæ Composita.**—Compound Tincture of Gentian. Gentian, 100; Bitter Orange Peel, 40; Cardamom, 10. By maceration and percolation with Alcohol and water, to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

ACTION AND THERAPEUTICS.

Gentian has the same action as other bitters, such as calumba, and is employed for the same class of cases. It is more used than any other bitter, because its taste is pleasant and it is not astringent.

QUASSIA.

QUASSIA.—The wood of *Picræna excelsa* [(Swartz) Lindley (nat. ord. *Simarubeæ*). *Habitat.*—Jamaica.

CHARACTERS.—In billets of various sizes, dense, tough, of medium hard-

1. **Extractum Quassiæ.**—[Extrac
with water and evaporation.

Dose, ½ to 3 gr.; .03 to .20 gm.

2. **Extractum Quassiæ Fluidum**
By maceration and percolation with Alc
tion.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

3. **Tinctura Quassiæ.**—Tincture
by maceration and percolation with Alcoh

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

ACTION AND THERAPEU

Quassia is an aromatic bitter stomac
way as calumba. As it contains no tann
with iron. The only objection to it is th
too bitter. Injected *per rectum*, it is an
for *Oxyuris vermicularis;* half a pint [2
[1 to 80 of cold water] may be given
patient being in the knee-chest position.]

CASCARILLA.

CASCARILLA.—[The bark of *Croton*
Euphorbiaceæ). *Habitat.*—Bahama Islands.

CHARACTERS.—In quills or curved pieces
grayish, somewhat

tral crystalline substance. (2) Volatile Oil, [1.5 per cent.] (3) Resin. (4) Tannin.

INCOMPATIBLES.—Mineral acids, lime water and metallic salts.

Dose, 10 to 30 gr.; [.60 to 2.00 gm.]

ACTION AND THERAPEUTICS.

Cascarilla, because of its bitter principle cascarillin, like other vegetable bitters, improves the digestion, and this stomachic and carminative action is aided by the volatile oil in it. It is pleasant to take, and is suitable for the same cases as calumba. The infusion [1 to 10] will not keep good for more than a day unless the tincture [1 to 8] is added to it. Mineral acids precipitate the resin from the tincture; therefore the infusion should be prescribed with them.

CHIRATA.

CHIRATA.—*Synonym.*—Chiretta. The [entire plant, *Swertia Chirata* Hamilton (nat. ord. *Gentianeæ*). *Habitat.*—Mountains of Northern India.

CHARACTERS.—Root nearly simple, about 7 cm. long; stem branched, nearly 1 meter long, slightly quadrangular above; containing a narrow wood-circle and a large yellowish pith. Leaves opposite, sessile, ovate, entire five-nerved. Flowers numerous, small, with a four-lobed calyx and carolla. The whole plant smooth, pale brown, inodorous, and intensely bitter.] *Resembling Chirata.*—Lobelia, which is not bitter.

COMPOSITION.—The chief constituents are—(1) *Chiratin*, [$C_{26}H_{46}O_{15}$,] an active, bitter principle, as a yellow, hygroscopic powder. (2) *Ophelic Acid*, [$C_{13}H_{20}O_{11}$], with which it is combined. No Tannin is present.

Dose, ½ to 1 dr.; [2. to 4. gm.]

Preparations.

[1. **Extractum Chiratæ Fluidum.**—Fluid Extract of Chirata. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

2. **Tinctura Chiratæ.**—Tincture of Chirata. Chirata, 100; by maceration and percolation with Alcohol and water to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

ACTION AND THERAPEUTICS.

Chirata has the same actions and uses as gentian, calumba, and other bitters. As it contains no tannin, it can be given with iron.

..., camphoraceous; taste warm, bit
of *Aristolochia reticulata* are coarser, l
Aristolochia Serpentaria.] *Resemb*
Arnica, and Valerian, (*q. v.*)

COMPOSITION.—The chief constitue
lochine, in light yellow needles. (2) *A*
Terpene, and mainly $C_{15}H_{25}O_2$, Borneol

[*Serpentaria is used to prepare* Tinc
Dose, 10 to 30 gr.; [.60 to 2.00 g

Preparat

[1. Extractum Serpentariæ pentaria. By maceration and perc evaporation.

Dose, 10 to 30 m.; .60 to 2.

2. Tinctura Serpentariæ.—[taria, 100; by maceration and perc 1000.

Dose, ½ to 2 fl. dr.; 2. to 8.

ACTION AND THE

In the small doses in which ser it is a bitter stomachic, acting just and it is used for the same class of alone. In large doses it prod-

CHARACTERS.—Heads subglobular, about 2 cm. broad, consisting of an imbricated involucre, and numerous white, strap-shaped, three-toothed florets, and few or no yellow tubular disk florets, inserted upon a chaffy, conical, solid receptacle. It has a strong, agreeable odor, and an aromatic, bitter taste.

COMPOSITION.—(1) *Anthemene*, $C_{18}H_{36}$, in tasteless needles. (2) A volatile oil, 1 per cent., containing *Anthemol*, $C_{10}H_{16}O$. (3) A Resin. (4) Tannin.

Dose, ½ to 2 dr.; 2. to 8. gm.

USES.

Chamomile is used as a mild stimulant for the languid appetite and general debility, which often attends convalescence from fevers.

MATRICARIA.

MATRICARIA. *Synonym.*—German Chamomile. The flower-heads of *Matricaria Chamomilla*, Linné (nat. ord. *Compositæ*). *Habitat.*—Europe and Western Asia.

CHARACTERS.—About 15 to 20 mm. broad, composed of a flattish, imbricate involucre, a conical, hollow, naked receptacle, which is about 5 mm. high, about fifteen white, ligulate, reflexed ray-florets, and numerous yellow, tubular, perfect disk-florets without pappus; strongly aromatic and bitter. *Resembling Matricaria.*—Anthemis Arvensis and Anthemis Cotula, but these have conical, solid, and chaffy receptacles.

COMPOSITION.—(1) Volatile Oil, ¼ per cent. (2) Anthemic Acid. (3) *Anthemidin*, probably a glucoside. (4) Tannin.

Dose, ¼ to 1 dr.; 1. to 4. gm.

USES.

The properties and uses are identical with those of Chamomile.]

CIMICIFUGA.

CIMICIFUGA. [*Synonyms.*—Black Snakeroot. Black Cohosh. The rhizome and roots of *Cimicifuga racemosa* (Linné) Nuttall (nat. ord. *Ranunculaceæ*). *Habitat.*—North America; in rich woodlands, westward to Eastern Kansas.

CHARACTERS.—The rhizome is of horizontal growth, hard, 5 cm. or more long, about 25 mm. thick, with numerous stout, upright or curved branches, terminated by a cup-shaped scar, and with numerous wiry, brittle, obtusely quadrangular roots, about 2 mm. thick; the whole brownish-black, of a slight but heavy odor, and of a bitter, acrid taste. Rhizome and branches have a smooth fracture, with a rather large pith, surrounded by numerous sublinear,

1. Extractum Cimicifu
tion and percolation with Alc
Dose, 1 to 5 gr.; .06 to

2. Extractum Cimicifug
fuga. By maceration and perc
Dose, ½ to 1 fl. dr.; 2.

3. Tinctura Cimicifugæ.
fuga, 200; by maceration and p
Dose, ½ to 2 fl. dr.; 2. t

Actic

Cimicifuga has two chief actic
secretion like any other bitter, and,
the rate, but increases the force of t
arterial tension rises. It is said
uterus and to increase the menstrua

Therapeu

It has been used for chorea, dy
rhœa, rheumatism, neuralgia, and
evidence that it does any good is sl

TARAXACUM

COMPOSITION.—The chief constituents are—(1) *Taraxacin*, a crystalline bitter principle, soluble in water and Alcohol. (2) *Taraxacerin*, $C_8H_{16}O$. (3) Inulin. (4) Resin (which gives the juice its milky appearance).

[IMPURITY.—The root of the Chicorium Intybus, which is paler, and has the milk vessels in radiating lines.]

Dose, 1 to 3 dr.; [4. to 12. gm.]

Preparations.

[1. **Extractum Taraxaci.**—Extract of Taraxacum. By expression and straining and evaporation.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

2. **Extractum Taraxaci Fluidum.**—Fluid Extract of Taraxacum. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, 1 to 4 fl. dr.; 4. to 15. gm.]

ACTION AND THERAPEUTICS.

Dandelion is a simple bitter, and acts as a stomachic, just like calumba. It is also slightly laxative. It was formerly much more used than at the present day. It has been said to stimulate the flow of bile, but this is incorrect.

AURANTII CORTEX.

AURANTII [AMARI CORTEX.—Bitter Orange Peel. The rind of the fruit of *Citrus vulgaris* Risso (nat. ord. *Rutaceæ*). *Habitat.*—Northern India; cultivated in subtropical countries.

CHARACTERS.—In narrow, thin bands, or in quarters; epidermis of a dark brownish-green color, glandular, and with very little of the spongy, white inner layer adhering to it; it has a fragrant odor, and an aromatic, bitter taste.

COMPOSITION.—The chief constituents are—(1) A volatile oil, consisting mainly of *Hesperidene*, $C_{10}H_{16}$, with a small portion of *Geraniol*, $C_{10}H_{16}O$. (2) *Hesperidin*, a bitter principle.

Bitter Orange Peel is used in preparing Tinctura Cinchonæ Composita and Tinctura Gentianæ Composita.]

Preparations.

[1. **Extractum Aurantii Amari Fluidum.**—Fluid Extract of Bitter Orange Peel. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

2. **Tinctura Aurantii Amari.**—Tincture of Bitter Orange Peel. Bitter Orange Peel, 200. By maceration and percolation with Alcohol and water to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.]

1. Syrupus Aurantii.—Syrup of
50; Precipitated Calcium Phosphate,
with Alcohol, mixture of the tincture in
water and filtration to 1000.

Dose, as vehicle.

2. **Tinctura Aurantii Dulcis.**—Ti
Sweet Orange Peel, 200. By maceration
to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.]

[OLEUM AURANTII CORTICIS.—
tile oil obtained by expression from the fresh pee
Citris vulgaris Risso, or the Sweet Orange, *Citrus*
Rutaceæ).

CHARACTERS.—A pale yellowish liquid, havir
odor of Orange, and an aromatic and, when obtai
somewhat bitter taste. Sp. gr., about 0.850.
volume of Alcohol.

IMPURITIES.—Oil of Turpentine or other oils
Oil of Orange Peel is contained in Spiritus N

Preparations.

1. **[Spiritus Aurantii.**—Spirit of Or
50; Deodorized Alcohol, 950.

Dose, as vehicle.

2. **Spiritus Aurantii Compositus.**—

By solution of the Compound Spirit of Orange in Deodorized Alcohol, to 250; addition of Syrup and Precipitated Calcium Phosphate, and filtering with distilled water to 1000.

Dose, as vehicle.]

[**OLEUM AURANTII FLORUM.**—Oil of Orange Flowers. *Synonym.*—Oil of Neroli. A volatile oil distilled from fresh flowers of the Bitter Orange, *Citrus vulgaris* Risso (nat. ord. *Rutaceæ*).

CHARACTERS.—A yellowish or brownish, thin liquid, having a very fragrant odor of Orange Flowers, and an aromatic, somewhat bitter taste. Sp. gr., 0.875 to 0.890. *Solubility.*—In an equal volume of Alcohol.

Preparations.

1. **Aqua Aurantii Florum Fortior.**—Stronger Orange Flower Water. *Synonym.*—Triple Orange Flower Water. Water saturated with the volatile oil of fresh Orange Flowers.

Dose, indeterminate.

2. **Aqua Aurantii Florum.**—Orange Flower Water. Stronger Orange Flower Water, 500; distilled water to 1000.

Dose, indeterminate.

3. **Syrupus Aurantii Florum.**—Syrup of Orange Flowers. Sugar, 850; Orange Flower Water to 1000.

Dose, indeterminate.]

ACTION AND THERAPEUTICS.

The various preparations of the orange are used largely as flavoring agents. They are slightly bitter and stomachic.

GROUP VIII.

Vegetable Drugs containing Tannic Acid

These are all astringent.

Oak Bark, Nutgall, Catechu, Krameria, Kino, Haematoxylon, Hamamelis, Rhus Glabra, Geranium, Pinus, Pumice

QUERCUS [ALBA.—White Oak. The bark of the [illegible] tree Linné (nat. ord. *Cupuliferæ*). *Habitat.* North America, naturalized in Minnesota, Kansas, and Mississippi; in woods.

CHARACTERS.—In nearly flat pieces, deprived of the outer layer about 4 mm. thick; pale brown; inner surface with short, shiny, longitudinal ridges

[illegible] of a sweet, bitter flavor, a faint, tea-like odor, and a strongly [illegible] taste.] Is met with in the drugs it is usually an irregularly coarse, [illegible] powder, which does not tinge the saliva yellow.

CONSTITUENTS.—The chief constituents are—(1) *Quercitannic acid* [$C_{76}H_{52}$ [illegible] $C_{14}H_{10}O_9$, it is 10] per cent, a variety of Tannic Acid. (2) *Quercin*, a [illegible] principle. (3) [illegible, a sugar.] (4) Resin.

[illegible] —See Tannic Acid.

GALLA.—Nutgall. An excrescence on *Quercus Asiatonica* Lenarck [illegible] Asia Minor, caused by the punctures and deposited ova of *Cynips* [illegible] (also *Simata*; called *Mezzanipiros*). *Habitat.*—[illegible].

CHARACTERS.—Subglobular, 1 or 2 cm. in diameter, more or less tuberculated above, otherwise smooth, heavy, hard; often with a circular hole near the middle, communicating with the central cavity; blackish olive-green or [illegible] gray, coarse granular, gnarled; in the centre a cavity containing either the partly developed insect, or pendent remains left by it; nearly inodorous, taste strongly astringent.]

CONSTITUENTS.—The chief constituents are—(1) *Tannic Acid*, [50 to 60] per cent. (2) *Gallic Acid*, 2 to [3] per cent. (3) Sugar. (4) Resin.

INCOMPATIBLES.—See Tannic and Gallic Acids.

Preparations.

1. **Tinctura Gallæ.**—[Tincture of Nutgall. Nutgall, 200; by maceration with Glycerin, 100, and Alcohol to 1000.

Dose, 1 to 2 fl. dr.; 4 to 8 c.c.]

2. **Unguentum Gallæ.**—[Nutgall Ointment. Nutgall, 20; Benzoinated Lard, 80.]

ACIDUM TANNICUM.—Tannic Acid, [$HC_{14}H_9O_9 = 321.22$. *Synonyms.*—Tannin. Gallotannic Acid. Digallic Acid. An organic acid extracted from Nutgall.

SOURCE.—(1) Expose powdered Nutgall to a damp atmosphere for twenty-four hours. (2) Add Ether to form a paste, and let it stand, closely covered, for six hours. (3) Express this in a close canvas cloth, between tinned plates, reduce the resulting cake to powder and mix with sufficient Ether and express as before. (4) Mix the expressed liquids and allow the mixture to evaporate spontaneously. Tannic Acid remains. [$2HC_7H_5O_5 - H_2O = HC_{14}H_9O_9$.]

CHARACTERS.—[A light yellowish, amorphous powder, usually cohering in form of glistening scales or spongy masses, odorless, or having a faint characteristic odor, and a strongly astringent taste; gradually turning darker when exposed to air and light. *Solubility.*—In about 1 part of water, and in 0.6 part of Alcohol; also in about 1 part of Glycerin, with the intervention of a

moderate heat; freely soluble in diluted Alcohol, sparingly in absolute Alcohol; almost insoluble in absolute Ether, Chloroform, Benzol or Benzin.]

INCOMPATIBLES.—Mineral acids, alkalies, antimony, lead, silver, and ferric salts, alkaloids, gelatin, and emulsions.

Dose, 1 to 20 gr.; [.06 to 1.20 gm.]

Preparations.

[1. **Collodium Stypticum.**—Styptic Collodion. Tannic Acid, 20; Alcohol, 5; Ether, 25; Collodion, to 100. By solution.

2. **Trochisci Acidi Tannici.**—Troches of Tannic Acid. Tannic Acid, 6; Sugar, 65; Tragacanth, 2 gm.; Stronger Orange Flower Water, a sufficient quantity to make 100 troches. Each contains about 1 gr.; .06 gm. of Tannic Acid.

Dose, 1 to 3 troches.

3. **Unguentum Acidi Tannici**—Ointment of Tannic Acid. Tannic Acid, 20; Benzoinated Lard, 80.

4. **Glyceritum Acidi Tannici.**—Glycerite of Tannic Acid. Tannic Acid, 20; Glycerin, 80.

ACTION.

External.—Tannic acid is one of our most important drugs, because it coagulates albumin and gelatin with great readiness; that is to say, it tans the tissues, for it is by coagulating the interstitial fluid in skins that tannic acid converts them into leather. If an albuminous discharge is taking place from a sore or mucous surface and tannic acid is applied, the excreted fluid is coagulated, and the coagulum forms a solid protecting layer which prevents further discharge. As the tannic acid soaks into the tissues it coagulates the albuminous fluids there also, and this still further hinders the discharge of fluid, therefore it is an energetic **astringent.** If bleeding is taking place, tannic acid of course coagulates the blood as it flows and the clots plug the vessels; at the same time the coagulum formed within the tissues, by its contraction, constricts the blood-vessels, and thus tannic acid becomes a powerful **hæmostatic.** Authorities differ as to whether it also contracts the blood-vessels by acting directly on them like lead, silver, ergot, etc., but probably it has no such action. Tannic acid is slightly antiseptic, and it is mildly depressant to sensory

nerves. Like other acids it is irritant, but it is very feebly so, and consequently its action in this direction is more than counterbalanced by its strongly astringent effects.

Internal. — *Gastro-intestinal tract.* — Because tannic acid coagulates the mucous secretions and the fluids in mucous membranes, it makes the mouth dry when locally applied; in the stomach and intestines it prevents the secretion of gastric and intestinal juices, and decreases the flow of mucus. For these reasons, and also because it precipitates pepsin, it interferes with digestion. In the intestine it is **converted into gallic acid,** but until this happens it can control gastric or intestinal bleeding. It is absorbed as gallic acid. Salts of tannic acid have no astringent properties.

Remote effects.—Gallic acid has no power to coagulate albumin, nor has it any astringent influence when locally applied, therefore it is difficult to believe that tannic acid has any remote astringent or hæmostatic effects; some claim that it has, but they have not proved their case. It is excreted in the urine as gallic and pyrogallic acids. Many vegetable substances, as logwood, depend, for their astringent properties, on the tannic acid they contain.

Therapeutics.

The therapeutical applications of tannic acid are very numerous. It is used as an astringent for ulcers, sores, various moist eruptions, tonsillitis, pharyngitis, nasal catarrh, otorrhœa, gastric catarrh, diarrhœa (large doses of 30 gr.; [2. gm.] may be given, and catechu and logwood are favorite remedies), leucorrhœa, gonorrhœa, rectal ulcers, fissures, and prolapse. It is employed as a hæmostatic in bleeding from small wounds, ulcers, the gums, the pharynx, the nose, the stomach, the intestine, hæmorrhoids, the bladder. Whenever practicable a good method of application is to dust it on the part, especially for a hæmorrhage; if this is gastric or intestinal, 30 gr.; [2. gm.] or more should be frequently given by the mouth. For external use or application to the throat the glycerite is useful. A gargle of the glycerite in water, [1 to 8] may be made. The [troches] are convenient

for pharyngitis. A
tion of tannic ac
larynx. The
ment of nutgall
positories
Solutions
bladder. The
injection.

ACIDUM

An organic

Source —

form of a
liquor,
purified
Characters —
or
permanent
Alcoh
slight
Incompatibles —
Note
Dose

PYROGALLOL

Characters —
and
and light
solution in the form of Ether

Action and Therapeutics.

It is used externally as an ointment (Jarisch's ointment is pyrogallic acid, 1; lard, 8.) for the treatment of chronic psoriasis. It is also an excellent parasiticide for ringworm. [Before pyrogallol is used, vaseline should be applied thoroughly, and wiped off, to remove scales and other morbid products.] It must not be applied over too large a surface, as it may be absorbed and produce toxic symptoms. Jarisch's ointment is very strong; a more usual strength is 1 or 2 or even less, to 48 of lard. [When it is applied in solution or ointment, it stains the skin, but not permanently; linen and clothing are, however, permanently darkened. To avoid the staining it has been proposed to dissolve the remedy in flexible collodion, 1 or 2 to 24.]

CATECHU.

CATECHU. *Synonym.*—Cutch. An extract [prepared from the wood of *Acacia Catechu* (Linné filius) Willdenow (nat. ord. *Leguminosæ*). *Habitat.*—India.

Characters.—In irregular masses, containing fragments of leaves, dark brown, brittle, somewhat porous and glossy when freshly broken. It is nearly inodorous, and has a strongly astringent and sweetish taste.]

Composition.—The chief constituents are—(1) *Catechu-tannic Acid*, about 35 per cent., the active principle, isomeric with Catechin, and converted into it by boiling or by the saliva, a red color being formed. (2) *Catechin* or *Catechuic Acid* [$C_{21}H_{20}O_9 + 5H_2O$], probably inactive. Both constituents give a green precipitate with Ferric Salts. (3) [Catechu-red.]

Incompatibles.—Alkalies, metallic salts, and gelatin.

Impurity.—Starch.

Dose, 10 to 30 gr.; [.60 to 2.00 gm.]

Preparations.

1. **Tinctura [Catechu Composita.**—Compound Tincture of Catechu. Catechu, 100; Cassia Cinnamon, 50; by maceration and percolation with diluted Alcohol, to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

2. **Trochisci Catechu.**—Troches of Catechu. Catechu, 6; Sugar, 65; Tragacanth, 2 gm.; Stronger Orange Flower Water, a sufficient quantity to make 100 troches. Each troche contains about 1 gr.; .06 gm.

Dose, 1 to 6 troches.]

Action and Therapeutics.

Catechu is a powerful **astringent**, acting in virtue of its tannic acid, and having a precisely similar action to it. It is used as a [troche] for sore throat, and the compound tincture is very efficacious for diarrhœa.

KRAMERIA.

[**KRAMERIA.** *Synonym.*—Rhatany. The root of *Krameria triandra* Ruiz et Pavon, and of *Krameria Ixina* Linné (nat. ord. *Polygaleæ*). *Habitat.*—Peru and Bolivia.

CHARACTERS.—From 1 to 3 cm. thick, knotty and several-headed above, branched below, the branches long; bark smooth or, in the thinner pieces, scaly, deep rust-brown, 1 to 2 mm. thick, very astringent, inodorous; wood pale brownish-red, tough, with fine medullary rays, nearly tasteless. The root of *Krameria Ixina* (Savanilla Rhatany) is less knotty and more slender, and has a dark purplish-brown bark, about 3 mm. thick.]

COMPOSITION.—The chief constituents are—(1) *Kramero-tannic Acid*, $C_{54}H_{24}O_{21}$, 20 per cent. (2) [*Rhatanin*]. (3) Rhatanic-red, [$C_{28}H_{22}O_{11}$], the coloring matter.

INCOMPATIBLES.—Alkalies, lime water, iron and lead salts, and gelatin.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparations.

1. **Extractum Krameriæ.**—[Extract of Krameria. By percolation with water, straining and evaporation.

Dose, 5 to 10 gr.; .30 to .60 gm.

2. **Extractum Krameriæ Fluidum.**—Fluid Extract of Krameria. By maceration and percolation with Glycerin and diluted Alcohol, and evaporation.

Fluid Extract of Krameria is used to make Syrupus Krameriæ.

Dose, 5 to 30 m.; .30 to 2.00 c.c.]

3. **Tinctura Krameriæ.**—[Tincture of Krameria. Krameria, 200; by maceration and percolation with diluted Alcohol to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

4. **Trochisci Krameriæ.**—Troches of Krameria. Extract of Krameria, 6; Sugar, 65; Tragacanth, 2 gm.; Stronger Orange Flower Water, a sufficient quantity to make 100 troches. Each troche contains about 1 gr.; .06 gm.

Dose, 1 to 5 troches.

5. **Syrupus Krameriæ.**—Syrup of Krameria. Fluid Extract of Krameria, 450; syrup, 550.

Dose, ½ to 4 fl. dr.; 2. to 15. c.c.]

Action.

The action of krameria is due entirely to the tannic acid it contains. It is therefore a powerful **astringent.**

Therapeutics.

The powdered extract is the important ingredient of many tooth powders which are useful when the gums are liable to bleed. An infusion is an excellent gargle for a relaxed throat, and the troches are also efficacious. Bleeding from the nose or the rectum may be stopped by applying powered krameria locally; the infusion [B. P. 1 to 20] may be used as an injection in leucorrhœa or gonorrhœa. Any of its preparations, especially [the fluid extract] are powerful astringents for all varieties of diarrhœa, and may be taken to stop bleeding from the stomach and intestines. They are also given as remote hæmostatics for hæmoptysis and hæmaturia, but they are not reliable for these purposes.

KINO.

KINO.—The [inspissated juice of *Pterocarpus Marsupium* Roxburgh (nat. ord. *Leguminosæ*). *Habitat.*—East Indies.

Characters.—Small, angular, dark brownish-red, shining pieces, brittle, in thin layers ruby-red and transparent, inodorous, very astringent and sweetish, tingeing the saliva deep red. *Solubility.*—Soluble in Alcohol, nearly insoluble in Ether, and only slightly soluble in cold water.]

Composition.—The chief constituents are—(1) *Kino-tannic acid*, $C_{18}H_{18}O_8$, 75 per cent. (2) *Kinoin*, a crystalline neutral principle. (3) *Pyrocatechin*, $C_6H_4(OH)_2$, a substance also found pathologically in the urine, and giving it a dark color. It reduces blue copper solutions. (4) Kino-red, formed from kino-tannic acid by oxidation. (5) Pectin.

Incompatibles.—Mineral acids, alkalies, all metallic salts, carbonates, and gelatin.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparation.

Tinctura Kino.—[Tincture of Kino. Kino, 100; Glycerin, 150. By maceration and filtration with water, 200; and Alcohol to 1000.

Dose, ¼ to 2 fl. dr.; 1. to 8. c.c.].

Action and Therapeutics.

Kino-tannic acid acts like tannic acid, and therefore kino is a powerful **astringent.** It is used in astringent gargles, and also in diarrhœa mixtures.

HÆMATOXYLON.

[**HÆMATOXYLON.** *Synonym.*—Logwood. The heart-wood of *Hæmatoxylon campechianum* Linné (nat. ord. *Leguminosæ*). *Habitat.*—Central America; naturalized in the West Indies.

CHARACTERS.—Heavy, hard, externally purplish-black, internally brownish-red, and marked with irregular, concentric circles, splitting irregularly; odor faint, agreeable; taste sweetish, astringent. When chewed, it colors the saliva dark pink. Logwood is generally met with in the form of small chips or coarse powder of a dark brownish-red color, often with a greenish lustre.] *Resembling Logwood.*—Red [Saunders], which is more dense and less astringent.

COMPOSITION.—The chief constituents are—(1) *Tannic acid.* (2) *Hæmatoxylin*, $C_{16}H_{14}O_6$, 12 per cent. Occurring in [sweet], colorless crystals, which become dark-red on exposure to light. Solutions of it are used to stain histological specimens. (3) *Hæmatein*, $C_{16}H_{12}O_6$, a product of oxidation of the former, having a green metallic lustre.

INCOMPATIBLES.—Mineral acids, lime water, and tartar emetic; metallic salts give a blue color.

Preparation.

[**Extractum Hæmatoxylon.**—Extract of Hæmatoxylon. By maceration in water, boiling, straining, and evaporation.

Dose, 5 to 15 gr.; .30 to 1.00 gm.]

Action and Therapeutics.

In virtue of its tannic acid, logwood is a powerful **astringent,** and for this purpose is used to control diarrhœa of all sorts. It may be combined with other astringents, as chalk and opium. It does not easily produce constipation. It colors the urine and fæces dark red. One disadvantage of it is that it stains linen, if dropped on it.

HAMAMELIS.

HAMAMELIS. [*Synonym.*—Witchhazel. The leaves of *Hamamelis virginiana* Linné (nat. ord. *Hamamelaceæ*), collected in autumn. *Habitat.*—North America, in thickets.

CHARACTERS.—Short-petiolate, about 10 cm. long, obovate or oval, slightly heart-shaped and oblique at the base, sinuate-toothed, thickish, nearly smooth; inodorous; taste astringent and bitter.]

COMPOSITION.—The chief constituents are—(1) *Tannin*, 8 per cent. (2) A bitter principle not yet isolated. (3) Resin.

Preparation.

[**Extractum Hamamelidis Fluidum.**—Fluid Extract of Hamamelis. By maceration and percolation with Glycerin, Alcohol and water, and evaporation.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

ACTION AND THERAPEUTICS.

Hamamelis is, because of its tannic acid, **astringent and hæmostatic.** The fluid extract is used for capillary hæmorrhage from wounds, for bleeding from the nose, the sockets of the teeth, the gums, or from piles, and it may be injected into the bladder in vesical hæmorrhage. For all these purposes it is diluted with water; the fluid may be any strength; the fluid extract in 10 or 20 parts of water is commonly employed. Locally applied, hamamelis, either as the ointment [B. P., 1 to 10] or a diluted fluid preparation, is used as an astringent in bruises, sprains, pharyngitis, and nasal catarrh. The ointment is often used for piles. Given by the mouth, hamamelis may check diarrhœa, dysentery, etc.; and it is reputed to be a remote hæmostatic and astringent, but this is probably incorrect.

[RHUS GLABRA.

RHUS GLABRA. *Synonym.*—Sumach. The fruit of *Rhus glabra* Linné (nat. ord. *Anacardieæ*). *Habitat.*—North America, west to Colorado and Idaho; in barren soil.

CHARACTERS.—Subglobular, about 3 mm. in diameter, drupaceous, crimson, densely hairy, containing a roundish-oblong, smooth putamen; inodorous; taste acidulous.

COMPOSITION.—The chief constituents are—(1) *Tannic Acid*, of which it contains from 6 to 27 per cent. (2) *Gallic Acid.* (3) Acid calcium and potassium malates. (4) A red coloring matter.

Preparation.

Extractum Rhois Glabræ Fluidum.—Fluid Extract of Rhus Glabra. By maceration and percolation with Glycerin and diluted Alcohol, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

ACTION AND USES.

Sumach fruit is astringent and refrigerant. The fluid extract, when diluted, affords a very useful and effective gargle for inflammation and ulceration of the throat.]

[GERANIUM.

GERANIUM. *Synonym.*—Cranesbill. The rhizome of *Geranium maculatum* Linné (nat. ord. *Geraniaceæ*). *Habitat.*—North America, in woods and thickets.

CHARACTERS.—Of horizontal growth, cylindrical, 5 to 7 cm. long; about 1 cm. thick; rather sharply tuberculated, longitudinally wrinkled, dark brown; fracture short, pale reddish-brown; bark thin; wood-wedges yellowish, small, forming a circle near the cambium line; medullary rays broad; central pith large; roots thin, fragile; inodorous; taste strongly astringent.

COMPOSITION.—(1) *Tannic Acid*, 12 to 17 per cent. (2) *Gallic Acid.* (3) Pectin.

Preparation.

Extractum Geranii Fluidum.—Fluid Extract of Geranium. By maceration and percolation with glycerin and diluted Alcohol, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

ACTION AND USES.

Geranium is one of the best indigenous astringents, and is of great use in diarrhœa and dysentery, and in the various hæmorrhages.]

[RUBUS.

RUBUS. *Synonym.*—Blackberry. The bark of the root of *Rubus villosus* Aiton, *Rubus canadensis*, Linné, and *Rubus trivialis* Michaux (nat. ord. *Rosaceæ*). *Habitat.*—North America, in fields and thickets.

CHARACTERS.—In thin, tough, flexible bands, outer surface blackish or blackish-gray, inner surface pale brownish, sometimes with strips of whitish, tasteless wood adhering; inodorous; taste strongly astringent, somewhat bitter.

COMPOSITION.—(1) *Tannic Acid*, 10 to 13 per cent. (2) *Gallic Acid*, 0.4 per cent. (3) *Villosin*, a bitter crystalline glucoside, soluble in Alcohol.

Preparations.

1. Extractum Rubi Fluidum.—Fluid Extract of Rubus. By maceration and percolation with Glycerin, Alcohol and water, and evaporation.

Fluid Extract of Rubus is used to make Syrupus Rubi.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

2. Syrupus Rubi.—Syrup of Rubus. Fluid Extract of Rubus, 250; Syrup, 750.

Dose, 1 to 2 fl. dr.; 4. to

ACTION A ES.

The preparations made from berry root are tonic and slightly astringent. They are us diarrhœa.]

[RUM

RUMEX. *Synonym.*—Yellow Do e root of *Rumex crispus* Linné, and of some other species of *Rumex* (nat. ord. *Polygonaceæ*). *Habitat.*—Europe; naturalized in North America, in grassy places and along roadsides.

CHARACTERS.—From 20 to 30 cm. long, about 10 to 15 mm. thick, somewhat fusiform, fleshy, nearly simple, annulate above, deeply wrinkled below; externally rusty brown, internally whitish, with fine, straight, interrupted, reddish, medullary rays, and a rather thick bark; fracture short; odor slight, peculiar; taste bitter and astringent.

COMPOSITION.—(1) *Tannic Acid.* (2) *Rumicin*, identical with *Chrysophanic Acid.* (3) Calcium Oxalate, and other salts.

Dose, ¼ to 1 dr.; 1. to 4. gm.

Preparation.

Extractum Rumicis Fluidum.—Fluid Extract of Rumex. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

ACTION AND USES.

Rumex is astringent, slightly tonic and alterative. It has been used in syphilis, scorbutic disorders, and cutaneous eruptions.]

GROUP IX.

Vegetable Demulcent Substances.

Olive Oil, Soap, Chondrus, Glycerin, Oleic Acid, Althæa, Almond, Tragacanth, Acacia, Ulmus, Liquorice, Linseed, Cetraria.

OLEUM OLIVÆ.

OLIVE OIL.—[*Synonym.*—Sweet oil. A fixed oil expressed from the ripe fruit of *Olea europæa* Linné (nat. ord. *Oleaceæ*). *Habitat.*—Asia and Southern Europe; cultivated.

CHARACTERS.—A pale yellow, or light greenish-yellow, oily liquid, having a slight, peculiar odor, and a nutty, oleaginous taste, with a faintly acrid after-taste. Sp. gr., 0.915 to 0.918. *Solubility.*—Very sparingly soluble in Alcohol, but readily soluble in Ether, Chloroform, or Carbon Disulphide.]

COMPOSITION.—The [three] constituents are—(1) *Olein*, 72 per cent., a fluid oil, a compound of Oleic Acid and Glyceryl, thus: $C_3H_5(C_{18}H_{33}O_2)_3$. (2) *Palmitin*, 28 per cent., a solid oil, a compound of Palmitic Acid, and Glyceryl, $C_3H_5(C_{16}H_{31}O_2)_3$. [(3) *Cholesterin*, $C_{26}H_{44}O$, soluble in Alcohol.] The formula for Oleic Acid is $HC_{18}H_{33}O_2$; and for Palmitic, $HC_{16}H_{31}O_2$.

IMPURITIES.—Cotton seed and other oils.

Dose, freely.

Olive Oil is contained in [Emplastrum Plumbi, Emplastrum Ferri, Emplastrum Picis Burgundicæ, Ceratum Cetacei, Unguentum Diachylon, and Unguentum Veratrinæ.]

SAPO.

SOAP.—Sodium Oleate, $NaC_{18}H_{33}O_2$. [*Synonyms.*—White Castile Soap. Hard Soap.

SOURCE.—Soap is prepared from Soda and Olive Oil. $C_3H_5(C_{18}H_{33}O_2)_3 + 3NaOH = 2NaC_{18}H_{33}O_2$ (hard Soap) $+ C_3H_5(OH)_3$ (Glycerin).

CHARACTERS.—A white or whitish solid, hard, yet easily cut when fresh, having a faint, peculiar odor free from rancidity, a disagreeable, alkaline taste, and an alkaline reaction. *Solubility.*—Soluble in water and in Alcohol, more readily with the aid of heat.

Soap is contained in Pilulæ Aloes, Pilulæ Aloes et Asafœtidæ, Pilulæ Asafœtidæ, Pilulæ Opii, and Pilulæ Rhei.

Preparations.

[1. **Emplastrum Saponis.**—Soap Plaster. Soap, 100; Lead Plaster, 900; by solution in water and evaporation.

2. **Linimentum Saponis.**—Soap Liniment. *Synonym.*—Opo-

deldoc. Soap, 70; Camphor, 45; Oil of Rosemary, 10; Alcohol, 750; water to 1000.

Soap liniment is used in Linimentum Chloroformi.]

SAPO MOLLIS.

SOFT SOAP.—Potassium Oleate. [*Synonyms.*—Sapo Viridis. Green Soap. A soap prepared from Potassa and fixed oils, generally from Olive Oil.]

SOURCE.—[By heating Linseed Oil, 400; adding to this Potassa, 90; dissolved in water, 450; and Alcohol, 40; until the mixture is soluble in boiling water without the separation of oily drops.

CHARACTERS.—A soft, unctuous mass, of a yellowish-brown or brownish-yellow color. *Solubility.*—In about 5 parts of hot water to a nearly clear liquid; also in 2 parts of hot Alcohol, without leaving more than 3 per cent. of insoluble residue.

Preparation.

Linimentum Saponis Mollis.—Liniment of Soft Soap. *Synonym.*—Tinctura Saponis Viridis. Soft Soap, 650; Oil of Lavender Flowers, 20; Alcohol, 300; water to 1000. By filtration.]

ACTION AND THERAPEUTICS.

External.—Olive oil is used to facilitate the rubbing of parts; for this purpose it is employed in massage. It is a common soothing protective to burns and may be mixed with poultices to prevent their adhering to the skin. If rubbed in vigorously, it can be absorbed through the epidermis, and might be thus used as a food when nourishment cannot be given by the mouth. [The soaps are used for cleansing. The plaster is protection against bed-sores. The liniment is used as a cutaneous stimulant. That of soft soap is employed for psoriasis, lichen and eczema.]

Internal.—For its soothing protective qualities it may be swallowed after corrosive poisons have been taken. It is an excellent mild laxative, and can be given with food for this purpose. Some persons like it, with others it excites nausea and vomiting. An olive oil enema (olive oil, 1; warm mucilage of starch, 2), or a soap enema (soap, 1; warm water, 32), is often used to open the bowels when a mild non-irritating injection is required.

Large doses of olive oil are said to facilitate the expulsion of gall-stones, but this is very doubtful.

Olive oil is a food, but it is not often used in this country as such. The history of fats and oils in the body is discussed in works on physiology.

[CHONDRUS.

CHONDRUS. *Synonyms.*—Irish Moss. Carragheen. The entire plant of *Chondrus crispus* Stackhouse, and *Gigartina mamillosa* J. Agardh (class *Algæ*). *Habitat.*—Atlantic Ocean.

CHARACTERS.—Yellowish or white, horny, translucent; many-times forked; when softened in water, cartilaginous; shape of the segments varying from wedge-shaped to linear; at the apex emarginate or two-lobed. It has a slight sea-weed odor, and a mucilaginous, somewhat saline taste.

COMPOSITION.—(1) Mucilaginous Compounds, 90 per cent. (2) Albuminoids. (3) Chlorides, sulphates and phosphates, with traces of bromides and iodides.

Dose, 2 to 4 dr.; 8. to 15. gm.

USES.

Irish Moss is not only a demulcent, but as well, when made into a jelly, is a useful article of diet.]

GLYCERINUM.

GLYCERIN.—[$C_3H_5(OH)_3 = 91.79$.

SOURCE.—A liquid obtained by the decomposition of vegetable or animal fats or fixed oils (*see* p. 13), and containing not less than 95 per cent. of absolute Glycerin.

CHARACTERS.—A clear, colorless liquid, of a thick, syrupy consistence, oily to the touch, odorless, very sweet and slightly warm to the taste. When exposed to the air, it slowly abstracts moisture. Sp. gr., not less than 1.250. *Solubility.*—In all proportions, in water or Alcohol; also soluble in a mixture of 3 parts of Alcohol and 1 part of Ether, but insoluble in Ether, Chloroform, Carbon Disulphide, Benzin, Benzol, and fixed or volatile oils.

Glycerin is contained in Elixir Phosphori, Liquor Ferri et Ammonii Acetatis, Mucilago Tragacanthæ, Massa Hydrargyri, Pilulæ Phosphori, in the Glycerita and in many Extracta, Extracta Fluida, Syrupi and Tincturæ.]

Dose, 5 to 60 m.; [.30 to 4.00 c.c.]

Preparations.

1. **[Glyceritum Amyli.**—Glycerite of Starch. Starch, 10; water, 10; Glycerin, 80.

Dose, freely.

2. **Glyceritum Vitelli.**—Glycerite of Yolk of Egg. *Synonym.*—Glyconin. Fresh yolk of egg, 45; Glycerin, 55.

Dose, freely.

3. **Suppositoria Glycerini.**—Suppositories of Glycerin. Glycerin, 60; Sodium Carbonate, 3; Stearic Acid, 5 gm. By solution with heat, pouring into ten moulds, and wrapping in tin-foil, when cold. Each suppository contains 90 gr.; 6. gm. of Glycerin.

Dose, as required.

Action.

External.—As glycerin is an excellent solvent for numerous [substances], such as iodine, bromine, alkalies, tannic acid, many neutral salts, alkaloids, salicin, etc., it is a good vehicle for applying these substances to the skin and to sores. It does not evaporate nor turn rancid, and is powerfully hygroscopic.

Internal.—In man the only visible effect produced by its administration is **purging.** This occurs with quite small doses if it is given by the rectum, but large doses are necessary if given by the mouth. It is absorbed from the alimentary canal, and is to a slight extent a food, for some of it is oxidized in the body. Sometimes its administration leads to the appearance in the urine of a body which reduces cupric oxide and gives the fermentation test for sugar. There has been much dispute as to whether glycerin can control nitrogenous metabolism, but it appears that it cannot in any way save the waste of nitrogenous tissues. It probably has some influence on the amount of glycogen in the liver. It has also been thought to prevent artificial glycosuria, but this is doubtful.

Very large doses in animals cause the urine to be dark from the presence of the coloring matter of the blood, although there are no corpuscles in it; they also lead to loss of muscular strength, lethargy, dryness of mucous membranes, collapse and death.

Therapeutics.

External.—Glycerin is much employed as a basis for applications to the skin and the eye. It is commonly used for chapped hands and slight excoriations. It is readily absorbed

when rubbed into the skin, therefore it is a convenient vehicle for the absorption of substances by the skin. [Atropine] mixed with glycerin is often rubbed in when we desire its local anodyne action (*see* p. 317).

Internal.—As glycerin is sweet, it is an excellent flavoring agent. It is demulcent, and is used as a vehicle for applying substances, such as tannic acid, to the throat. It is rarely given by the mouth for any medicinal virtue. It has been administered for dyspepsia, for diabetes, and as a nutritive agent, but in each case without any good result. One to two fl. dr. [4. to 8. c.c.] injected into the rectum, or a glycerin suppository, form an excellent means of opening the bowels in simple constipation, especially when the fæces are in the sigmoid flexure and rectum. The result is prompt, often occurring within less than half an hour. No pain nor constitutional disturbance is produced.

ACIDUM OLEICUM.

OLEIC ACID.—$HC_{18}H_{33}O_2$ [= 281.38.

SOURCE.—An organic acid, prepared in a sufficiently pure condition by cooling commercial Oleic Acid to about 41° F.; 5° C., then separating and preserving the liquid portion.] In the case [that it is obtained from] Olive Oil the reaction is $C_3H_5(C_{18}H_{33}O_2)_3 + 3H_2O = 3HC_{18}H_{33}O_2 + C_3H_5(OH)_3$ (Glycerin).

CHARACTERS.—A [yellowish or brownish-yellow, oily liquid, having a peculiar, lard-like odor and taste; becoming darker and absorbing Oxygen on exposure to air. It becomes semi-solid at 40° F.; 4.4° C. Sp. gr., about 0.900. *Solubility.*—Insoluble in water; soluble in Alcohol, Chloroform, Benzol, Benzin, Oil of Turpentine, and fixed and volatile oils.]

IMPURITIES.—It is rarely pure, usually containing Stearic and Palmitic Acids.

[*Oleic Acid is used to prepare* Oleatum Hydrargyri, Oleatum Veratrinæ, and Oleatum Zinci.] There is some doubt whether the pharmacopœial oleates are chemical combinations or simple solutions.

ACTION AND THERAPEUTICS.

Oleic acid is used as a solvent for remedies which it is desired to apply by means of cutaneous inunction, for it more readily penetrates the skin than fats and oils.

[ALTHÆA.

ALTHÆA. Synonym.—Marshmallow. The root of *Althæa officinalis* Linné (nat. ord. *Malvaceæ*). *Habitat*.—Europe, Western and Northern Asia; naturalized in the Eastern United States and in Australia, in salt marshes; cultivated in Europe.

CHARACTERS.—In cylindrical or somewhat conical pieces, from 10 to 15 cm. long, 10 to 15 mm. in diameter, deeply wrinkled; deprived of the brown, corky layer and small roots; [illegible] white, marked with a number of circular spots, and of a somewhat [illegible] annate from the loosened bast-fibres; internally whitish and fleshy [illegible] reaks with a short granular and mealy fracture, has a faint, aromatic [illegible] a sweetish, mucilaginous taste. *Resembling Althæa*.—Young and [illegible] Belladonna roots, but these have no hair-like bast-fibres upon the surface.

COMPOSITION.—(1) *Asparagin*, [illegible]. (2) *Starch*, a mucilage, 35 per cent. (3) Sugar, 8 per cent. (4) [illegible] 10 per cent.

Preparations.

Syrupus Althææ.—Syrup of Althæa. Althæa, 50; Alcohol, 30; Glycerin, 100; Sugar, 700; water to 1000.

Dose, freely.

USES.

Marshmallow is used as a demulcent, for irritation and inflammation of mucous membranes.]

AMYGDALA.

AMYGDALA AMARA.—Bitter Almond. The seed of *Prunus Amygdalus*, var. *amara* [De Candolle (nat. ord. *Rosaceæ*). *Habitat*.—Western Asia; naturalized in the Mediterranean basin; cultivated.

CHARACTERS.—About 25 mm. long, oblong-lanceolate, flattish, covered with a cinnamon-brown, scurfy testa, marked by about sixteen lines emanating from a broad scar at the blunt end. The embryo has the shape of the seed, is white, oily, consists of two plano-convex cotyledons, and a short radicle at the pointed end, and has a bitter taste. When triturated with water, Bitter Almond yields a milk-white emulsion, which emits an odor of Hydrocyanic Acid.]

COMPOSITION.—The chief constituents are—(1) *Oleum Amygdalæ Expressum* (*see* p. 532), 45 per cent., the same fixed oil as in the sweet variety. (2) *Emulsin*. (3) *Amygdalin*, [$C_{20}H_{27}NO_{11}$, a crystalline glucoside, having a sweetish-bitter taste,] which yields *Oleum Amygdalæ Amaræ*. This oil does not exist in the bitter almond, but it is obtained by distillation with water. It

is very important to distinguish it from the *Oleum Amygdalæ Expressum*, which is harmless, but the oil of bitter almond is usually very poisonous from admixture of [Hydrocyanic] Acid; for if moisture has had access to the glucoside Amygdalin, on which, in the presence of water, the emulsin in the almond acts as a ferment, the [volatile] oil of bitter almond [benzaldehyde] glucose and [Hydrocyanic] Acid are formed. $C_{20}H_{27}NO_{11} + 2H_2O = [C_7H_6O]$ (the volatile oil) $+ HCN + 2C_6H_{12}O_6$. The oil when separated from the [Hydrocyanic] Acid is not poisonous, and is used to flavor sweets. An artificial oil of bitter almond called Nitrobenzol is often substituted, and has caused death.

Bitter Almond is used in Syrupus Amygdalæ.

[**OLEUM AMYGDALÆ AMARÆ.**—Oil of Bitter Almond.

SOURCE.—A volatile oil obtained from Bitter Almond by maceration with water, and subsequent distillation.

CHARACTERS.—A clear, colorless or yellowish, thin, and strongly refractive liquid, having a peculiar, aromatic odor, and a bitter and burning taste. Sp. gr., 1.060 to 1.070. Boiling point, about 356° F.; 180° C. Optically inactive. *Solubility.*—In 300 parts of water, and in Alcohol or Ether in all proportions; also soluble in Nitric Acid at ordinary temperatures without the evolution of nitrous vapors.

Dose, ⅙ to ½ m.; .01 to .03 c.c.

Preparations.

1. **Aqua Amygdalæ Amaræ.**—Bitter Almond Water. Oil of Bitter Almond, 1; distilled water, 999. By solution and filtration.

Dose, 2 to 4 fl. dr.; 8. to 15. c.c.

2. **Spiritus Amygdalæ Amaræ.**—Spirit of Bitter Almond. *Synonym.*—Essence of Bitter Almond. Oil of Bitter Almond, 10; Alcohol, 800; distilled water, to 1000.

Dose, 15 to 45 m.; 1. to 3. c.c.]

AMYGDALA DULCIS. — Sweet Almond. *Synonym.* — Jordan Almond. [The seed of *Prunus Amygdalus*, var. *dulcis* De Candolle (nat. ord. *Rosaceæ*). *Habitat.*—Western Asia; naturalized in the Mediterranean basin; cultivated.

CHARACTERS.—Closely resembling the bitter almond (*see Amygdala Amara*), but having a bland, sweetish taste, free from rancidity. When triturated with water, it yields a milk-white emulsion, free from the odor of Hydrocyanic Acid.]

COMPOSITION.—The chief constituents are—(1) *Oleum Amygdalæ Expressum* (*see* below), 56 per cent., a fixed oil. (2) *Emulsin*, and other albuminous bodies.

IMPURITY.—The bitter almond, giving an odor of [Hydrocyanic] Acid when rubbed with water.

Preparations.

[1. **Emulsum Amygdalæ.**—Emulsion of Almond. *Synonyms.*—Mistura Amygdalæ. Milk of Almond. Sweet Almond, 60; Acacia, 10; Sugar, 30; distilled water, 1000.

Dose, indeterminate.

2. **Syrupus Amygdalæ.**—Syrup of Almond. Sweet Almond, 140; Bitter Almond, 40; Sugar, 200; Orange Flower Water, 100; Water, 130; Syrup to 1000.

Dose, indeterminate.]

OLEUM AMYGDALÆ [EXPRESSUM.—Expressed Oil of Almond.

SOURCE.—A fixed oil expressed from Bitter or Sweet Almond.

CHARACTERS.—A clear, pale straw-colored or colorless, oily liquid, almost inodorous, and having a mild, nutty taste. Sp. gr., 0.915 to 0.920. *Solubility.*—Only slightly soluble in Alcohol; soluble in Ether and in Chloroform in all proportions.

Expressed Oil of Almond is contained in Emulsum Chloroformi and Unguentum Aquæ Rosæ.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

ACTION AND THERAPEUTICS.

The sweet almond is demulcent. Its most important medicinal use is that it is made into flour to replace starchy food in cases of diabetes. Biscuits are made of the flour. These are very palatable, are a good nutritive food, and contain very little starch. The only objection to them is their price. With a little care they can be made at home. The flour of other nuts, as Brazil nuts, has been used, but it is not nearly so palatable. The almond emulsion is a very pleasant vehicle for the suspension of insoluble substances, and the powdered almond is a palatable basis for powders. The expressed oil of almond might be used for the same purposes as olive oil. It is pleasanter, but very expensive.

TRAGACANTHA.

TRAGACANTH.—A gummy exudation from [*Astragalus gummifer* Labillardière, and from other species of *Astragalus* (nat. ord. *Leguminosæ*). *Habitat.*—Western Asia.

CHARACTERS.—In narrow or broad bands, more or less curved or contorted, marked by parallel lines or ridges, white or faintly yellowish, translucent, horn-like, tough, and rendered more easily pulverizable by a heat of 122° F.; 50° C. Very sparingly soluble in cold water, but swells into a gelatinous mass, which is tinged violet (not so deep as the color given by starch) by tincture of iodine.] *Resembling Tragacanth.*—Squill, which is thicker and opaque.

IMPURITIES. - Other gums.

COMPOSITION.—The chief constituents are—(1) *Bassorin*, $C_6H_{10}O_5$, a gum 33 per cent., only slightly soluble in water, unfermentable. (2) *Arabin*, a Calcium Salt of gummic acid, but not identical with [the Arabin, or Arabic acid of Acacia.] (3) A little starch.

[*Tragacanth is contained in* several troches.

Preparation.

Mucilago Tragacanthæ.—Mucilage of Tragacanth. Tragacanth, 6; Glycerin, 18; water to 100. By heating, maceration and straining. **Dose, indeterminate.]**

ACTION AND THERAPEUTICS.

Tragacanth is a demulcent, and as such may be soothing when applied to a sore throat. Its chief use is to suspend insoluble bodies, as resins, oils, and insoluble powders.

ACACIA.

[**ACACIA.** *Synonym.*—Gum Arabic. A gummy exudation from *Acacia Senegal* Willdenow (nat. ord. *Leguminosæ*). *Habitat.*—Eastern Africa, principally Kordofan; Western Africa, near the river Senegal.

CHARACTERS.—In roundish tears of various sizes, or broken into angular fragments, with a glass-like, sometimes irridescent fracture, opaque from numerous fissures, but transparent and nearly colorless in thin pieces; nearly inodorous; taste insipid, mucilaginous; insoluble in Alcohol, but soluble in water, forming a thick, mucilaginous liquid. *Solubility.*—Slowly but completely soluble in 2 parts of water; insoluble in Alcohol.]

COMPOSITION.—The chief constituent is *Arabin*, or *Arabic Acid*, $C_{12}H_{22}O_{11}$; combined with Calcium, Magnesium and Potassium.

IMPURITIES.—Starch, and gum resins.

INCOMPATIBLES.—Alcohol, sulphuric acid, borax, ferric salts and lead subacetate.

[*Acacia is contained in* Emulsum Amygdalæ, Pulvis Cretæ Compositus, and in some Trochisci.

Preparations.

1. **Mucilago Acaciæ.**—Mucilage of Acacia. Acacia, 340; water, to 1000.

Mucilage of Acacia is contained in Mistura Glycyrrhizæ Composita and Syrupus Acaciæ.

Dose, freely.

2. **Syrupus Acaciæ.**—Syrup of Acacia. Mucilage of Acacia, 25; Syrup, 75.

Dose, freely.]

ACTION AND THERAPEUTICS.

Acacia is demulcent. It is used to suspend insoluble substances, as oils, resins, and insoluble powders. A fluid ounce [30. c.c.] of most oils or resinous tinctures requires 3 fl. dr. [12. c.c.] of mucilage of acacia for suspension, but copaiba requires 10 fl. dr. [40. c.c.]. A disadvantage of it is that it is liable to ferment and decompose. It may give rise to indigestion and diarrhœa.

ULMUS.

[**ELM.** *Synonym.*—Slippery Elm Bark. The inner bark of *Ulmus fulva* Michaux (nat. ord. *Urticaceæ*). *Habitat.*—North America, west to Louisiana and Nebraska, in woods.

CHARACTERS.—In flat pieces, varying in length and width, about 3 mm. thick, tough, pale brownish-white, the inner surface finely ridged; fracture fibrous and mealy; the transverse section delicately checkered; odor slight, peculiar; taste mucilaginous, insipid.

COMPOSITION.—It contains mostly (1) Mucilage. (2) Some Tannic Acid.

Dose, 2 dr.; 8. gm., or more.

Preparation.

Mucilago Ulmi.—Mucilage of Elm. Elm, 6; boiling water, 100. By digestion and straining.

Dose, freely.

ACTION AND USES.

Slippery Elm Bark is an excellent demulcent. It is especially recommended in dysentery, diarrhœa and diseases of the urinary passages.]

GLYCYRRHIZA.

GLYCYRRHIZA. [*Synonym.*—Liquorice Root. The root of *Glycyrrhiza glabra* Linné, and of the variety *glandulifera* (Waldstein et Kittaibel) Regel et Herder (nat. ord. *Leguminosæ*). *Habitat.*—Southern Europe and Western Asia; cultivated.

CHARACTERS.—In long, cylindrical pieces, from 5 to 25 mm. thick, longitudinally wrinkled, externally grayish-brown, warty; internally tawny-yellow; pliable, tough; fracture coarsely fibrous; bark rather thick; wood porous, but dense, in narrow wedges; medullary rays linear; taste sweet, somewhat acrid. The underground stem, which is often present, has the same appearance, but contains a thin pith. The drug derived from the variety *glandulifera* (so-called Russian Liquorice), consists usually of roots or root-branches, 1 to 4 cm. thick, 15 to 30 cm. long, frequently deprived of the corky layer, the wood rather soft, and usually more or less cleft.] *Resembling Liquorice.*—Pyrethrum and Taraxacum, which are not sweet.

COMPOSITION.—The chief constituents are—(1) *Glycyrrhizin* [$C_{24}H_{36}O_9$, about 6 per cent.], a yellow amorphous glucoside, probably in combination with Ammonia. With acids this yields a very bitter substance, *Glycyrrhetin*, and glucose. (2) *Asparagin*, [about 3 per cent. (3) *Glycyramin*. (4) An acrid Resin.] (5) Starch.

[*Glycyrrhiza is used in* Decoctum Sarsaparillæ Compositum, Extractum Sarsaparillæ Fluidum Compositum, Massa Hydrargyri, Pilulæ Ferri Iodidi, Pulvis Morphinæ Compositus, Tinctura Aloes, and Tinctura Aloes et Myrrhæ.]

Liquorice or its preparations are contained in many preparations, generally to cover their nauseous taste. They [conceal] very well that of Aloes [Rhamnus Purshiana], Ammonium Chloride, Hyoscyamus, Senega, Senna, Turpentine, and bitter sulphates, as Quinine Sulphate.

Preparations.

1. **Extractum Glycyrrhizæ.**—[Extract of Glycyrrhiza. *Synonym.*—Extract of Liquorice.

CHARACTERS.—In flattened, cylindrical rolls, from 15 to 18 cm. long, and from 15 to 30 mm. thick; of a glossy, black color. It breaks with a sharp, conchoidal, shining fracture, and has a very sweet peculiar taste. Not less than 60 per cent. of it should be soluble in cold water.

Extract of Glycyrrhiza is contained in Trochisci Ammonii Chloridi and Trochisci Glycyrrhizæ et Opii.

Dose, freely.

2. **Extractum Glycyrrhizæ Purum.**—Pure Extract of Glycyrrhiza. By maceration and percolation with Water of Ammonia and distilled water, and evaporation.

Pure Extract of Glycyrrhiza is used to make Mistura Glycyrrhizæ Composita.

Dose, freely.

3. **Extractum Glycyrrhizæ Fluidum.**—Fluid Extract of Glycyrrhiza. By maceration and percolation with Water of Ammonia, Alcohol and water, and evaporation.

Dose, freely.

4. **Glycyrrhizinum Ammoniatum.**—Ammoniated Glycyrrhizin.

SOURCE.—Glycyrrhiza, by ma[illegible]n and percolation with Water of Ammonia and water; pre[illegible]with Sulphuric Acid, solution with Water of Ammonia, and [illegible]

CHARACTERS.—Dark brow[illegible]nish-red scales, without odor, and having a very sweet taste. [illegible]ly.—Readily in water and in Alcohol.

Dose, 5 to 15 gr.; -30 t[illegible]1.]

5. **Pulvis Glycyrrhizæ c[illegible]us.** *See* Senna, p. 425.

6. [**Mistura Glycyrrhiz[illegible]osita.**—Compound Mixture of Glycyrrhiza. *Synonym.*—Brown [illegible]re. Pure Extract of Glycyrrhiza, 30; sugar, 50; Mucilage of Acacia, 100; Camphorated Tincture of Opium, 120; Wine of Antimony, 60; Spirit of Nitrous Ether, 30; water, to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

ACTION AND THERAPEUTICS.

Liquorice is an excellent demulcent for sore throats. It is used to conceal the taste of [disagreeable] medicines, and as a basis for pills. The compound liquorice powder is laxative by virtue of its senna [although liquorice itself has distinct laxative properties].

LINUM.

[**LINSEED** *Synonym.*—Flaxseed. The seed of *Linum usitatissimum* Linné (nat. ord. *Linaceæ*). *Habitat.*—Levant and Southern Europe; cultivated and spontaneous in most temperate countries.

CHARACTERS.—About 4 or 5 mm. long; oblong-ovate, flattened, obliquely pointed at one end, brown, glossy, covered with a transparent, mucilaginous epithelium, which swells considerably in water; the embryo whitish or pale greenish, with two large, oily, plano-convex cotyledons, and a thin perisperm; inodorous; taste mucilaginous, oily and bitter.

COMPOSITION.—(1) A viscid, fixed oil, 30 to 35 per cent. in the nucleus. (2) Mucilage, 15 per cent. in the epithelium. (3) Proteids, 25 per cent. (4) *Amygdalin*, a minute quantity.]

OLEUM LINI.—[Linseed Oil. *Synonym.*—Oil of Flaxseed. A fixed oil expressed from Linseed without the use of heat.

CHARACTERS.—A yellowish or yellow, oily liquid, having a slight, peculiar odor, and a bland taste. When exposed to the air it gradually thickens, and acquires a strong odor and taste. Sp. gr., 0.930 to 0.940. *Solubility.*—In about 10 parts of Alcohol, and in all proportions in Ether, Chloroform, Benzin, Carbon Disulphide, or Oil of Turpentine.

COMPOSITION.—Its most characteristic principles are—(1) *Linolein.* (2) *Myristin.* (3) *Palmitin.* (4) Albumin, a large percentage, to which its drying properties are due.]

Dose, ½ to 2 fl. oz.; [15. to 60. c.c.]

ACTION AND THERAPEUTICS.

Linseed tea [linseed, 3; liquorice, 1; boiling water, 100] is a common domestic demulcent; the large quantity of mucilage it contains forms a coating for the pharnyx and mouth, and thus relieves cough due to sore throat. It is said to be slightly diuretic.

A linseed poultice [4 to 10 of boiling water] is a very common means of applying warmth and moisture to a part. It is used to relieve pain, and as a mild irritant to accelerate inflammation and the bursting of an abscess, or as a counter-irritant in all sorts of deep-seated inflammations. The poultices should not be too thick, and should be smeared with oil to prevent their sticking to the skin.

Linseed oil is applied to burns. Mixed with an equal quantity of Solution of Lime it forms Carron Oil (*see* Lime, p. 145.)

CETRARIA.

CETRARIA. *Synonym.*—Iceland Moss. *Cetraria islandica* [(Linné) Acharius (class *Lichenes*). *Habitat.*—Northern Hemisphere.

CHARACTERS.—From 5 to 10 cm. long, foliaceous, irregularly branched into fringed and channelled lobes, brownish above, whitish beneath, and marked with small, depressed spots; brittle and inodorous; when softened in water, cartilaginous, and having a slight odor; its taste is mucilaginous and bitter.]

COMPOSITION.—The chief constituents are—(1) *Lichenin*, [$C_{12}H_{20}O_{10}$, and *Isolichenin*,] 70 per cent. (2) *Cetraric Acid*, [$C_{18}H_{16}O_8$], a bitter principle, 2 per cent. [(3) *Lichen-stearic Acid*, $C_{14}H_{34}O_3$, 1 per cent. (4) Fumaric Acid. (5) Oxalic Acid.

IMPURITIES.—Pine leaves, mosses and other lichens.]

Preparation.

Decoctum Cetrariæ.—[Decoction of Cetraria. Cetraria, 50. By boiling in water and straining to 1000.]

Dose, 1 to 4 fl. oz.; [30. to 120. c.c.]

ACTION AND THERAPEUTICS.

The decoction is demulcent, and may be given in sore throat. The moss is a food, but it is very seldom used.

GROUP X.

Vegetable drugs which are used to kill parasites.

CLASS I. *Anthelmintics* for the various species of *Tapeworm*.

Aspidium, Pomegranate, Kousso, Kamala, Pepo.

CLASS II. *Anthelmintics* for the *Roundworm* (*Ascaris lumbricoides*).

Santonica, Spigelia, Chenopodium.

CLASS III. *Parasiticides* used for *Pediculi*.

Stavesacre, Picrotoxin.

Anthelmintics for the *Threadworm* (*Oxyuris vermicularis*), are described under the head of astringents (*see* p. 513).

CLASS I.

ASPIDIUM.

[**ASPIDIUM.** *Synonym.*—Male Fern. The rhizome of *Dryopteris Filix-mas* Schott, and of *Dryopteris marginalis* Asa Gray (nat. ord. *Filices*). *Habitat.*—North America, Northern Asia, Europe.

CHARACTERS.—From 5 to 15 cm. long, 10 to 25 mm. in thickness, and, together with the closely imbricated, dark brown, roundish, and slightly curved stipe-remnants, 50 to 75 mm. in diameter; densely covered with brown, glossy, transparent, and soft, chaffy scales; internally pale green, rather spongy; vascular bundles about ten (*Dryopteris Filix-mas*) or six (*Dryopteris marginalis*) in number, arranged in an interrupted circle; odor slight, but disagreeable; taste sweetish, acrid, somewhat bitter, astringent, and nauseous.]

COMPOSITION.—The chief constituents are—(1) *Filicic acid*, [$C_{35}H_{42}O_{13}$,

a white, amorphous, crystalline body, said to be the active principle. (2) A fixed oil, 6 to 7 per cent. (3) *Filicin*, $C_{28}H_{46}O_{12}$, a crystalline substance, soluble in Chloroform, Benzol and fixed and volatile oils. (4) Filix-red. (5) Resins.

Dose, ½ to 1½ dr.; 2. to 6. gm.

Preparation.

Oleoresina Aspidii.—Oleoresin of Aspidium. By percolation with Ether, distillation of the Ether, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.]

ACTION AND THERAPEUTICS.

[Aspidium] is the most certain anthelmintic for the tape worm we have. It may be flavored with ginger or peppermint. The intestine should first be emptied with a little castor oil to ensure the worm not being protected by food. Then the [aspidium] should be administered, and about twelve hours afterwards another dose of castor oil should be given to clear away the dead worm. Very little food should be taken during the treatment, and the head of the worm should be carefully searched for in the motion. [Recently several cases of poisoning have been reported, presumably not due to an excessive dose, but to the fact that the oil was administered at the same time with it, notably increasing its absorption.]

GRANATUM.

[**POMEGRANATE.**—The bark of the stem and root of *Punica Granatum* Linné (nat. ord. *Lythrarieæ*). *Habitat.* India and Southwestern Asia; cultivated and naturalized in subtropical countries.

CHARACTERS.—In the quills or fragments, from ½ to 10 cm. long, and from 1 to 3 mm. thick; outer surface yellowish gray, somewhat warty, or longitudinally and reticulately ridged; the stem-bark often partly covered with blackish lichens; the thicker pieces of the root-bark more or less scaly externally; inner surface smooth, finely striate, grayish yellow, fracture short, granular, greenish-yellow; indistinctly radiate; inodorous; taste astringent, very slightly bitter.]

COMPOSITION.—The chief constituents are [(1) *Punico-tannic Acid*, $C_{20}H_{18}O_{13}$, 20 per cent. (2) *Pelletierine*, $C_8H_{15}NO$, ½ per cent., a colorless, oily, aromatic alkaloid, soluble in water, Alcohol, Ether and Chloroform. (3) Three allied alkaloids, *Methyl-*, *Pseudo-*, and *Iso pelletierine*.]

INCOMPATIBLES.—Alkalies, lime water, metallic salts, and gelatin.

Dose, ½ to 1½ dr.; [2. to 6. gm.]

Action and Therapeutics.

Pomegranate is a powerful **astringent,** and the decoction [B. P., 1 to 10] may be used as a gargle for a sore throat. In large doses it is emetic and purgative. It is believed to be **anthelmintic** for the tapeworm. It is usually said that pelletierine [dose of tannate, 3 to 6 gr.; .20 to .40 gm.] is the active anthelmintic principle; but according to some the tapeworm is not killed, but is expelled by the purgative, by which a dose of the decoction is usually followed.

CUSSO.

KOUSSO. *Synonyms.*—[Brayera. Kooso. The female inflorescence of *Hagenia abyssinica* (Bruce) Gmelin (nat. ord. *Rosaceæ*). *Habitat.*—Abyssinia.

Characters.—In bundles, rolls, or compressed clusters, consisting of panicles about 25 cm. long, with a sheathing bract at the base of each branch; the two roundish bracts at the base of each flower, and the four or five obovate, outer sepals are of a reddish color, membranous and veiny; calyx top-shaped, hairy, enclosing two carpels or nutlets; odor slight, fragrant and tea-like; taste bitter, acrid, and nauseous.

Composition.—The chief constituents are—(1) *Kosin* or] *Koussin*, a neutral, active principle, [in yellow crystals, tasteless, soluble in Chloroform, Benzol, Ether and Alcohol; insoluble in water. (2) Oil. (3) Gum. (4) Tannin Acid. (5) Two Resins.

Dose, 2 to 4 dr.; 8. to 15. gm.]

Preparation.

[Extractum Cusso Fluidum.—Fluid Extract of Kousso. *Synonym.*—Extractum Brayeræ Fluidum. By maceration and percolation with Alcohol and evaporation.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

Action and Therapeutics.

Kousso is used as an anthelmintic for all species of tapeworm. [Koussin has been given with good results. Dose 20 to 40 gr.; 1.20 to 2.40 gm.

KAMALA.

KAMALA. [*Synonym.*—Rottlera. The glands and hairs from the capsules of *Mallotus philippinensis* (Lamarck) Mueller Arg. (nat. ord. *Euphorbiaceæ*). *Habitat.*—India, China, Philippine Islands.

CHARACTERS.—A granular, mobile, brick-red or brownish-red powder, inodorous and nearly tasteless, imparting a deep red color to alkaline liquids, Alcohol, Ether, or Chloroform, and a pale, yellow tinge to boiling water. Under the microscope it is seen to consist of stellately arranged, colorless hairs, mixed with depressed-globular glands, containing numerous red, club-shaped vesicles.] *Solubility.*—Insoluble in hot and cold water. Alcohol, Ether, or Chloroform forms deep red solutions.

COMPOSITION.—The chief constituents are—(1) *Rottlerin*, [$C_{22}H_{20}O_6$, a neutral principle in yellowish needles, soluble in hot Alcohol, in Ether, Benzol, and Carbon Disulphide. (2) Resins, nearly 80 per cent.]

Dose, 1 to 2 dr.; [4. to 8. gm.]

ACTION AND THERAPEUTICS.

Kamala is an **anthelmintic.** It will kill the *Tænia solium*, and probably also the *Oxyuris vermicularis* and the *Ascaris lumbricoides*. It is also purgative.

[PEPO.

PUMPKIN SEED.—The seed of *Cucurbita Pepo* Linné (nat. ord. *Cucurbitaceæ*). *Habitat.*—Tropical Asia and America; cultivated.

CHARACTERS.—About 2 cm. long, broadly-ovate, flat, white or whitish, nearly smooth, with a shallow groove parallel to the edge; containing a short, conical radicle and two flat cotyledons; inodorous; taste bland and oily.

COMPOSITION.—(1) Fixed oil, 44 per cent. (2) An Acrid Resin, considered to be the tæniafuge principle. (3) The Proteids (*Myosin* and *Vitellin*). (4) Fatty Acids.

Dose, 1 to 3 oz.; 30. to 90. gm.

USES.

Pepo administered as an emulsion is one of the most efficient and harmless tæniafuges.]

CLASS II.

SANTONICA.

SANTONICA. [*Synonym.*—Levant Wormseed. The unexpanded flower-heads of *Artemisia pauciflora* Weber (nat. ord. *Compositæ*). *Habitat.*—Turkestan.

CHARACTERS.—From 2 to 4 mm. long, oblong-ovoid, obtuse, smooth, somewhat glossy, grayish-green, after exposure to light brownish-green, consisting of an involucre of about 12 to 18 closely imbricated, glandular scales

give rise to symptoms of narcotic poisoning, which, however, may be obviated by its combination with a cathartic like senna.

CHENOPODIUM.

CHENOPODIUM. *Synonym.*—American Wormseed. The fruit of *Chenopodium ambrosioides* Linnè, and variety *anthelminticum* Gray (nat. ord. *Chenopodiaceæ*). *Habitat.*—West India and Central America; naturalized in the United States.

CHARACTERS.—Nearly 2 mm. in diameter, depressed-globular, glandular, dull greenish or brownish, the integuments friable, and containing a lenticular, obtusely-edged, glossy, black seed. It has a peculiar, somewhat terebinthinate odor, and a bitterish, pungent taste.

COMPOSITION.—It is composed chiefly of a volatile oil, consisting of (1) a hydrocarbon, $C_{10}H_{16}$ and (2) a liquid, oxygenated oil, $C_{10}H_{16}O$.

Dose, 15 to 30 gr.; 1. to 2. gm.

OLEUM CHENOPODII.—Oil of Chenopodium. *Synonym.*—Oil of American Wormseed. A volatile oil distilled from Chenopodium.

CHARACTERS.—A thin colorless or yellowish liquid, having a peculiar, penetrating, somewhat camphoraceous odor, and a pungent and bitter taste. Sp. gr., about 0.970.

Dose, 2 to 10 m.; .12 to .60 c.c.

ACTION AND USES.

Wormseed is one of the most efficient anthelmintics, particularly against *Ascarides*, but it should be followed by a cathartic.]

CLASS III.

STAPHISAGRIA.

STAPHISAGRIA. [*Synonym.*—Stavesacre. The seed of *Delphinium Staphisagria* Linnè (nat. ord. *Ranunculaceæ*). *Habitat.*—Basin of the Mediterranean; cultivated.

CHARACTERS.—About 5 mm. long, 3 or 4 mm. broad, flattish-tetrahedral, one side convex, brown or brownish-gray, with reticulate ridges, containing a whitish, oily albumen and a straight embryo; nearly inodorous; taste bitter and acrid.]

COMPOSITION.—The chief constituents are—(1) *Delphinine*, [$C_{22}H_{33}NO_6$, a white, crystalline, poisonous alkaloid, soluble in Alcohol, Ether and Chloroform, resembling Aconite in its action. (2) *Delphinoidine*, $C_{42}H_{68}N_2O_7$, an amorphous alkaloid, solubility as of Delphinine. (3) *Delphisine*, $C_{27}H_{46}N_2O_4$, a crystalline alkaloid of the same solubility. (4) *Staphisagrine*, $C_{22}H_{32}NO_5$, an alkaloid but slightly soluble in water. (5) Fixed oil, 25 per cent.]

Action and Therapeutics.

[Staphisagria] is only used as a **parasiticide** to kill pediculi. The affected part is rubbed with the ointment, 1 to 2 of benzoinated lard, which, in the case of *pediculi vestimentorum*, is allowed to soak, day and night, into the garments next to the skin, for the parasite inhabits them.

PICROTOXINUM.

PICROTOXIN.—$C_{30}H_{34}O_{13}$[= 600.58. A neutral principle obtained from the seed of *Anamirta paniculata* Colebrooke (nat. ord. *Menispermaceæ*). *Habitat.*—East India.

Source.—Obtained by exhaustion with hot Alcohol, evaporation and purification by recrystallization, after decolorizing with Animal Charcoal.

Characters.—Colorless, flexible, shining, prismatic crystals, or a microcrystalline powder, odorless, and having a very bitter taste; permanent in the air. *Solubility.*—Soluble in 240 parts of water, and in 9 parts of Alcohol; also soluble in solutions of the alkalies, and in acids. Very slightly soluble in Ether or Chloroform]

Dose, $\frac{1}{120}$ to $\frac{1}{60}$ **gr.**; [.0005 to .001 **gm.**]

Action.

External.—Picrotoxin is very destructive to lower forms of life, and is therefore **antiparasitic.**

Internal.—It is a powerful poison, causing convulsions, hyperpyrexia and stimulation of the respiratory centre. Its mode of action is unknown.

Therapeutics.

External.—An ointment of the seeds in lard [1 to 6] has been applied to the scalp to kill pediculi. It must be employed with caution, for this strong poison can be absorbed if the skin be broken. It is an expensive ointment.

Internal.—Picrotoxin is used empirically, to **check** the night **sweating** of phthisis. A single dose should be given in the evening. Its action is uncertain, but sometimes it succeeds. Many other diseases have been treated with it, but there is no evidence that it has benefited them. [Tablets], each containing

UVA URSI. *Synonym.*—Bearb
Uva Ursi (Linné) Sprengel (nat. ord. *E*
sphere, in dry and sandy or rocky places;
sylvania, New Mexico, and California.

CHARACTERS.—Very short-stalked,
ceous, from 15 to 20 mm. long, and 5 to 8
on the margin, upper surface with depre
reticulate; odor faint, hay-like; taste stron
Resembling Uva Ursi.—Senna and Buchu

COMPOSITION.—The chief constituent
bitter, crystalline glucoside yielding glucose,
quinone. (2) *Ericolin*, [$C_{10}H_{16}O$, a bitter,
a tasteless neutral body. (4) Tannic Acid,

INCOMPATIBLES.—Iron, lead and silver

Dose, ¼ to 1 dr.; 1. to 4. gm.]

Preparatio

[1. Extractum Uvæ Ursi.—
tion and percolation with Alcohol an
Dose, 5 to 15 gr.; .30 to 1.00
2. Extractum Uvæ Ursi Flui
By maceration and percolati

infectant action is probably due to the decomposition of the arbutin into glucose and hydroquinone, for after Uva Ursi is given this substance is found in the urine, and it is a very energetic antiseptic. This decomposition must take place in the kidneys, for hydroquinone is a powerful poison. Against this being the reason of the disinfectant action of Uva Ursi, it is urged that giving arbutin does not disinfect the urine; but others deny this, and the probability is that the first-mentioned view is correct. Arbutin is a powerful diuretic. The urine may be a pale greenish to dark greenish-brown color. Hydroquinone is also found in the urine in carbolic acid poisoning (*see* p. 284). The astringent action of Uva Ursi on the urinary tract is usually ascribed to the tannic acid; but as it is not a remote astringent, this is most likely wrong.

Therapeutics.

Uva Ursi is given to disinfect the urine in the same class of cases as buchu—that is to say, in pyelitis, cystitis and gonorrhœa.

SCOPARIUS.

SCOPARIUS. *Synonym.*—Broom. The tops of *Cytisus Scoparius* [(Linnê) Link (nat. ord. *Leguminosæ*). *Habitat.*—Western Asia, Southern and Western Europe; naturalized in some localities in the United States.

Characters.—In thin, flexible, branched twigs, pentangular, winged, dark green, nearly smooth, tough, usually free from leaves; odor peculiar when bruised; taste disagreeably bitter.]

Composition.—The chief constituents are—(1) *Scoparin*, $C_{21}H_{22}O_{10}$, a [tasteless, amorphous, neutral principle, said to be diuretic. (2) *Sparteine*, $C_{15}H_{26}N_2$, a colorless, oily, very bitter alkaloid. (3) Tannic Acid.

Dose, ¼ to 1 dr.; 1. to 4. gm.]

Preparation.

[**Extractum Scoparii Fluidum.**—Fluid Extract of Scoparius. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.]

Action.

Broom has no external action, and very little beyond the fact that it is **diuretic** is known about its internal action; [its alka-

APOCYNUM. Synonym.—Cat
[illegible] Linné [illegible] ord. Apocynaceæ
border of thickets and in grassy places.

CHARACTERS.—Long, cylindrical, so
gray or brownish-gray, longitudinally
brittle; fracture short, white; the bark rat
with delicate, medullary rays; inodorous;

COMPOSITION.—The chief constituen
soluble in water, acting like digitalin. (2)
glucoside.

Dose, 10 to 20 gr.; .60 to 1.20 (em
(alterative).

Preparation.

Extractum Apocyni Fluidum
By maceration and percolation with
evaporation.

Dose, 2 to 20 m.; .12 to 1.20 c

USES.

Canadian Hemp has been found
because of its action which is not
resembling that of strophanthus and
an infusion (1 to 16), of [illegible]
ounces [illegible]

yellowish or greenish, soft-silky, finely hairy, and delicately veined longitudinally; inodorous; taste sweetish.

COMPOSITION.—Its chief constituents are—(1) *Maizenic Acid*, about 2 per cent. (2) Fixed Oil. (3) Resin. (4) Salts.

Dose, 1 to 2 dr.; 4. to 8. gm.

ACTION AND USES.

Corn-silk is a mild but fairly certain diuretic when given in full doses. It is useful in acute and chronic cystitis and in the bladder-irritation of uric acid and for phosphatic gravel. It is possibly as well a cardiac stimulant in the dropsy of heart disease. It is best administered in the form of an infusion, in boiling water (1 to 8), taken almost *ad libitum*.

TRITICUM.

TRITICUM. *Synonym.*—Couch-Grass. The rhizome of *Agropyrum repens* (Linné) Beauvois (nat. ord. *Gramineæ*), gathered in the spring and deprived of the roots. *Habitat.*—Europe and North America.

CHARACTERS.—Very long and creeping, about 2 mm. thick; as met with in the shops, cut into sections about 1 cm. long; smooth, but wrinkled; hollow in the centre, straw-yellow; inodorous; taste sweetish.

COMPOSITION.—(1) *Triticin*, about 8 per cent., a gummy substance resembling Inulin. (2) Inosit. (3) Malates.

Dose, 1 to 8 dr.; 4. to 30. gm.

Preparation.

Extractum Tritici Fluidum.—Fluid Extract of Triticum. By percolation with boiling water, evaporation, addition of Alcohol and filtration.

Dose, 1 to 8 fl. dr.; 4. to 30. c.c.

ACTION AND THERAPEUTICS.

Triticum is a diuretic, and is used as a sedative in inflammation of the genito-urinary membranes.

MARRUBIUM.

MARRUBIUM. *Synonym.*—Horehound. The leaves and tops of *Marrubium vulgare* Linné (nat. ord. *Labiatæ*). *Habitat.*—Europe, Central Asia; naturalized in North America; cultivated.

CHARACTERS.—Leaves about 25 mm. long, opposite, petiolate, roundish-ovate, obtuse, coarsely crenate, strongly rugose, downy above, white-hairy

Horehound, used as a decc
diuretic, in large doses laxa
increase the action of the skin
marked. It is probably also a

PAR

[**PAREIRA.** *Synonym.*—Pare
tomentosum Ruiz et Pavon (nat. ord. *M*

CHARACTERS.—Subcylindrical, so
cm. long, varying in thickness from 2
gray, with transverse ridges and fissure
pale brown, and, when freshly cut, ha
porous, in two or more somewhat irreg
large medullary rays, and no distinct cen

COMPOSITION.—The chief constitu
0.5 per cent., identical with Berberine (*s*

INCOMPATIBLES—Ferric and lead sa

Dose, ½ to 1 dr.; [2. to 4. gm.]

Prepara

Extractum Pareiræ [Fluid
maceration and percolation with
evaporation.

Dose, ½ to 1 fl dr

CHIMAPHILA.

[**CHIMAPHILA.** *Synonyms*—Pipsissewa. Prince's Pine. The leaves of *Chimaphila umbellata* (Linné) Nuttal (nat. ord. *Ericaceæ*). *Habitat.*—Northern Continent.

CHARACTERS.—About 5 cm. long, oblanceolate, sharply serrate above, wedge-shaped and nearly entire towards the base; coriaceous, smooth, and dark-green on the upper surface. It is nearly inodorous, and has an astringent and bitterish taste.

COMPOSITION.—(1) *Arbutin, see* p. 546. (2) *Ericolin.* (3) *Chimaphilin,* in yellow, tasteless, volatile crystals. (4) Ursone. (5) Tannic Acid, 4 per cent.

Dose, ½ to 2 dr.; 2. to 8. c.c.

Preparation.

Extractum Chimaphilæ Fluidum.—Fluid Extract of Chimaphila. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

ACTION AND USES.

This plant is diuretic, tonic, and astringent. It is used for rheumatism and nephritic affections.]

GROUP XII.

Vegetable drugs acting locally on unstriped muscle, especially that of the uterus.

Ergot, Cotton Root Bark, Caulophyllum, Viburnum.

ERGOTA.

ERGOT. [*Synonym.*—Ergot of Rye. The sclerotium of *Claviceps purpurea* (Fries) Tulasne (class *Fungi*), replacing the grain of rye, *Secale cereale* Linné (nat. ord. *Gramineæ*). *Habitat.*—Spain and Russia.

CHARACTERS.—Somewhat fusiform, obtusely triangular, usually curved, about 2 or 3 cm. long, and 3 mm. thick; three-furrowed, obtuse at both ends, purplish-black, internally whitish with some purplish striæ, breaking with a short fracture; odor peculiar, heavy; taste oily and disagreeable.]

COMPOSITION.—The chief constituents are—[(1) *Ergotine,* $C_{35}H_{52}N_2O_3$, an alkaloid, amorphous, feebly bitter; soluble in Alcohol and water. (2) *Ecboline,* an alkaloid, amorphous, slightly bitter; soluble in water and

striction.

The chief use of ergot is to
uterus after labor, and so to d
hæmorrhage. If there is any l
should be given subcutaneously, s

Ergot should be administered
expelled, for the contraction pro
becomes more severe, but more p
uterus remains tightly contracted
course, dangerous to the life of the
very great, may lead to rupture of

This drug has often been given
and other hæmorrhages from differ
authors claim great success. Fre
quite closes the bleeding vessels it
general rise of blood-pressure, do
difficult to [estimate] its value, f
stop even if no drugs are given. I
night-sweats of phthisis, and as an

It is often desirable to combine
[ferric] chl-

herbaceum Linné, and of other species of *Gossypium* (nat. ord. *Malvaceæ*). *Habitat.*—Subtropical Asia and Africa; cultivated in the United States.

CHARACTERS.—In thin, flexible bands or quilled pieces; outer surface brownish-yellow, with slight longitudinal ridges or meshes, small, black, circular dots, or short, transverse lines, and dull, brownish-orange patches, from the abrasion of the thin cork; inner surface whitish, of a silky lustre, finely striate; bast-fibres long, tough, and separable into papery layers; inodorous; taste very slightly acrid and faintly astringent.

COMPOSITION.—(1) A yellow Resin. (2) A fixed Oil. (3) Tannic Acid. (4) Yellow coloring matter.

Dose, ½ to 1 dr.; 1. to 4. gm.

Preparation.

Extractum Gossypii Radicis Fluidum.—Fluid Extract of Cotton Root Bark. By maceration and percolation with Glycerin and Alcohol, and evaporation.

Dose, ½ to 1 fl. dr.; 1. to 4. c.c

ACTION AND USES.

Cotton Root Bark has the same action as Ergot, and is an emmenagogue and an abortifacient. It is used as an uterine hæmostatic in the treatment of menorrhagia and metrorrhagia from various causes, and particularly from uterine fibroids.

CAULOPHYLLUM.

CAULOPHYLLUM. *Synonyms.*—Blue Cohosh. Squaw Root. The rhizome and roots of *Caulophyllum thalictroides* (Linné) Michaux (nat. ord. *Berberidaceæ*). *Habitat.*—North America, southward to Kentucky, in rich woodlands.

CHARACTERS.—Rhizome of horizontal growth, about 10 cm. long, and about 6 to 10 mm. thick, bent; on the upper side with broad, concave stem-scars and short, knotty branches; externally grayish-brown, internally whitish, tough and woody. Roots numerous, matted, about 10 cm. long, and 1 mm. thick, rather tough; nearly inodorous; taste sweetish, slightly bitter and somewhat acrid.

COMPOSITION.—Its chief constituents are—(1) *Caulophylline*, an alkaloid which is colorless, odorless and almost tasteless, and crystallizes with difficulty. (2) *Saponin*. (3) Resins, 12 per cent. (4) Tannin.

Dose, 5 to 30 gr.; .30 to 2 00 gm.

CHARACTERS.—In thin pieces or q
tered warts and minute black dots; wl
brown; the thin, corky layer easily remov
whitish, smooth; fracture short; inodor

COMPOSITION.—Its chief constitue
(2) *Viburnin*, a greenish-yellow, bitt
(4) Tannic Acid. (5) Oxalates. (6) (

Dose, ¼ to 1 dr.; 1. to 4. gm.

Prepara

Extractum Viburni Pruni
Viburnum Prunifolium. By mace
and water, and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4

VIBURNUM OPULUS. *Syno*
Cranberry. The bark of *Viburnum Opu*
Habitat.—North America, from New Brur
Pennsylvania, in low grounds.

CHARACTERS.—In flattish or curved b
times 30 cm. long, and from 1 to 1.5 m
marked with scattered somewhat transver
color, due to abrasion, and more or less ma
in a longitudinal direction with black, irre
neath the easily-removed corky layer of a p
brown color; the inner surface dingy-whi

Action and Uses.

Viburnum is believed to be an antispasmodic, diuretic and tonic. It is especially used in the nervous diseases of pregnancy and to prevent miscarriage. It has considerable reputation as a remedy for spasmodic dysmenorrhœa, in the treatment of after-pains, and in menorrhagia. This remedy has been in extensive use for more than twenty years and is undoubtedly of value.]

GROUP XIII.

Colchicum.

The sole value of this drug is that it is a specific for gout.

COLCHICUM.

COLCHICI [RADIX.—Colchicum Root. The corm of *Colchicum autumnale* Linné (nat. ord. *Liliaceæ*). *Habitat.*—Southern and Central Europe.

Characters.—About 25 mm. long, ovoid, flattish and with a groove on one side; externally brownish and wrinkled; internally white and solid; often in transverse slices, reniform in shape, and breaking with a short, mealy fracture; inodorous; taste sweetish, bitter and somewhat acrid.]

Composition.—The chief constituents are—(1) *Colchicine*, [$C_{22}H_{25}NO_6$, about 0.5 per cent., the active principle; a bitter alkaloid, usually amorphous, but may be obtained in prismatic crystals, soluble in water and Alcohol, and Chloroform, but changed by most acids into *Colchiceine*, $C_{21}H_{23}NO_6$, which also occurs naturally, of the same solubility as Colchicine, except that it is with difficulty soluble in water.] (2) Starch. (3) Sugar. (4) Gum.

Incompatibles.—All astringent preparations, Tincture of Iodine, and Tincture of Guaiacum.

Dose, 2 to 8 gr.; [.12 to .50 gm.,] in powder.

Preparations.

[1. **Extractum Colchici Radicis.**—Extract of Colchicum Root. By maceration and percolation with Acetic Acid and water, and evaporation.

Dose, ½ to 2 gr.; .03 to .12 gm.

2. **Extractum Colchici Radicis Fluidum.**—Fluid Extract of Colchicum Root. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 2 to 8 m.; .12 to .50 c.c.

...ct the proportion of the act...
...2. A fixed oil, [0 to 8 per ...
Dose, 1 to 5 gr.; [.06 ...

[1. **Extractum C...**
Colchicum Seed. By ...
water, and evaporation.
Dose, 1 to 5 m.; .0...
2. **Tinctura Colchi...**
Colchicum Seed, 150; by ...
water to 1000.
Dose, 10 to 30 m.; .0...
3. **Vinum Colchici S...**
chicum Seed, 150; by macer...
Wine to 1000.]
Dose, 10 to 30 m.; [.6...

Ac...

External.—When applied t...
irritant, causing hyperæmi...
gives rise to ...

in fact a powerful **gastro-intestinal irritant**. There is also great prostration, the pulse becomes small, rapid, and thready, the skin cold and bedewed with sweat, and the respiration slow; death is due to collapse. It is extremely probable that these results are not owing to any action of colchicine on the heart or respiration, but that they are merely the consequence of the severe gastro-enteritis, which, it is well known, will cause fatal collapse. These effects are produced if colchicine is injected subcutaneously, a circumstance which shows that this alkaloid is an active principle of the drug, and that it is excreted into the intestine. It is a curious fact that after a certain point, increasing the quantity does not lead to an increase of the symptoms.

Nervous system.—Medicinal doses have no effect. Even a fatal dose does not impair consciousness. In frogs the reflex excitability of the cord is at first increased by large doses, and hence there may be convulsions. In mammals these do not take place, but in all animals ultimately the spinal motor centres are powerfully depressed, and the creature is paralyzed. Motor nerves and muscles are unaffected. Sensory nerves are somewhat depressed.

Kidney.—The most discordant statements have been made about the action of colchicum on the urine, but it has not been definitely shown that either the quantity or composition is altered. After death by poisoning, the alkaloid is found in the blood and in most of the organs of the body.

Therapeutics.

Colchicum is hardly ever used except for gout. Given during the attack, it most markedly relieves the pain; in smaller doses given between the attacks it diminishes their severity. It is often very useful for dyspepsia, eczema, headache, neuritis, conjunctivitis, bronchitis, and other conditions which, when occurring in those suffering from gout, are probably related to it. Occasionally it is combined with other cholagogues, especially if it is desired to give these remedies to a person who is the subject of gout. If any symptoms of gastric or intestinal irritation appear,

CAMPHOR. *Synonyms.*—G
[= 151.66. A stearopten (having th
namomum Camphora (Linné) Nees
purified by sublimation. *Habitat.*—C

SOURCE.—The branches and ch
boiling water, the volatilized Camphor
the adherent volatile oil (Oil of Camp
mation in vessels of glass or iron.

CHARACTERS.—White, translucen
crystalline structure, readily pulverizab
Ether, or Chloroform; having a penet
gently aromatic taste. Sp. gr., 0.995.
ordinary temperatures. Sublimes entir
sparingly soluble in water, but readily s
Carbon Disulphide, Benzin, and in fixe
is triturated in about molecular proporti
Chloral, liquefaction ensues.]

COMPOSITION.—All Camphors or stea
carbons which contain 10 atoms of carbo
part of volatile oils, of which Oil of Tur
meric with the terpene of Oil of Turpe
ender, Oil of Spearmint, Oil of Anis
Menth

[*Camphor is contained in* Linimentum Belladonnæ, Linimentum Sinapis Compositum, Linimentum Saponis, Tinctura Opii Camphorata and Pulvis Morphinæ Compositus.]

Dose, 3 to 20 gr.; [.20 to 1.20 gm.]

Preparations.

1. **[Aqua Camphoræ.**—Camphor Water. Camphor, 8; by trituration with Alcohol, 5; and precipitated Calcium Phosphate, 5; addition of water, and filtration to 1000.

Dose, ½ to 2 fl. oz.; 15. to 60. c.c.

2. **Linimentum Camphoræ.**—Camphor Liniment. *Synonym.*—Camphorated Oil. Camphor, 200; Cotton Seed Oil, 800.

3. **Spiritus Camphoræ.**—Spirit of Camphor. Camphor, 100; Alcohol to 1000. By solution and filtration.

Dose, 30 to 60 m.; 2. to 4. c.c.

4. **Ceratum Camphoræ.**—Camphor Cerate. Camphor Liniment, 100; White Wax, 300; Lard, 600.]

[CAMPHORA MONOBROMATA. — Monobromated Camphor. $C_{10}H_{15}BrO = 230.42$.

SOURCE.—By heating Bromine and Camphor, at 172° F.; 77.7° C., solution in Benzin, and recrystallization from hot Alcohol. $C_{10}H_{16}O + 2Br = C_{10}H_{15}BrO + HBr$.

CHARACTERS.—Colorless, prismatic needles or scales, having a mild, camphoraceous odor and taste, permanent in the air, unaffected by light, and neutral to litmus paper. *Solubility.*—Almost insoluble in water; freely soluble in Alcohol, Ether, Chloroform, hot Benzin, and fixed and volatile oils; slightly soluble in Glycerin. It is also soluble without decomposition in cold, concentrated Sulphuric Acid, from which it separates again unaltered, when the solution is poured into water.

Dose, 2 to 10 gr.; .12 to .60 gm.]

ACTION.

External.—Camphor, although not a volatile oil, acts very much like one. Thus it is a direct cutaneous stimulant, dilating the vessels of the skin, and at first causing a sensation of **warmth**, but subsequently a slight degree of local **anæsthesia.** It is a feeble antiseptic.

Internal.— *Gastro-intestinal tract.*—In the stomach it is mildly **stimulant,** dilating the vessels, increasing the flow of

Respiration.—Probably s
bronchial mucous membrane
which it consequently stimulat
a feeble expectorant.

Skin.—It is a mild **diaphc**
be due to the action of the dr
Probably some of the camphor
sweat may smell of it.

Nervous system.—Different
to the effects of camphor. Five
will in some persons produce
others a sense of comfort and
great excitement, giddiness, a s
ache, burning pains in the stoma
delirium, violent convulsions,
pulse, and finally death from coll

Sexual organs.—Camphor is
but this is probably incorrect.

Kidneys.—It is not excreted
substances, one of which is camp

addition to the pharmacopœial preparations, a Chloroformum Camphoræ (camphor, 2 parts, dissolved in chloroform, 1 part) may be used. The liquid preparations with chloral, carbolic acid, and thymol are excellent local anodynes for neuralgia, and may be dropped into a tooth to relieve toothache.

Internal.—Camphor is used as a carminative, especially in neurotic subjects. It is a common remedy for a cold in the head, and is probably beneficial on account of its stimulation of the circulation and its slight antipyretic and diaphoretic effects. Many expectorant mixtures contain camphor. It has been given as an antispasmodic in hysteria and allied conditions, and some state that it is of use in cholera. [Monobromated Camphor resembles, but is not identical with, the bromides in its therapeutical action, being used as a nervous sedative.]

THYMOL.

THYMOL.—$C_{10}H_{14}O$[= 149.66. A phenol (classified in the B. P. as a stearopten) occurring in the volatile oils of (1) *Thymus vulgaris* Linné, (2) *Monarda punctata* Linné (nat. ord. *Labiatæ*), and (3) *Carum Ajowan* (Roxburgh) Bentham et Hooker (nat. ord. *Umbelliferæ*). *Habitat.*—(1) Southern Europe; cultivated. (2) United States, west to Texas and Colorado; in sandy fields. (3) India, Persia, Egypt.

SOURCE.—Thymol is separated from the terpenes in the volatile oils by fractional distillation, agitated with solution of Soda to remove more of the terpenes, and cooled. The compound of Soda and Thymol is decomposed by Hydrochloric Acid, and Thymol is recrystallized from an alcoholic solution.

CHARACTERS.—Large, colorless, translucent crystals of the hexagonal system, having an aromatic, thyme-like odor, and a pungent, aromatic taste, with a very slight caustic effect upon the lips. Sp. gr., as a solid, is 1.069, but when liquefied by fusion it is lighter than water. When triturated with about equal quantities of Camphor, Menthol, or Chloral, it liquefies. *Solubility.*—Soluble in about 1200 parts of water, and in less than its own weight of Alcohol, Ether, or Chloroform; also readily soluble in Carbon Disulphide, Glacial Acetic Acid, and in fixed or volatile oils.

IMPURITIES.—Paraffin, and spermaceti.

Dose, 1 to 15 gr.; .06 to 1.00 gm.]

ACTION AND THERAPEUTICS.

Thymol is a more powerful **antiseptic** than carbolic acid.

nal use.

ME

MENTHOL.—$C_{10}H_{19}OH$[= acter of a secondary Alcohol), ob (from *Mentha piperita* Smith), or fr (from *Mentha arvensis* Linné, var. *densis* Linné, var. *glabrata* Holmes;

SOURCE.—By fractional distillat higher boiling product, and crystalliz

CHARACTERS.—Colorless, acicul and pure odor of peppermint, and a sation of cold, when air is drawn into ble in water, but imparts to the latter Alcohol, Ether, Chloroform, Carbor When it is triturated with about an Chloral, the mixture becomes liquid.]

IMPURITIES.—Glass and magnesi

Dose, ½ to 2 gr.; [.03 to .12 g

ACTION AND

Menthol is chiefly employed anæsthesia, a feeling of coldn alleviates the pain of neuralgia, ficial nerve

used with advantage in asthma. It is readily volatilized by the addition of hot water. Solutions of it have been painted upon the throat in diphtheria. [It has been used internally in small doses ($\frac{1}{10}$ gr.; .006 gm.) to relieve nausea and vomiting].

GROUP XV.

Vegetable drugs acting by virtue of important acids they contain.

Lemon juice (Citric Acid), **Prunus Virginiana** (Hydrocyanic Acid), **Benzoin** (Benzoic Acid), **Chrysarobinum** (Chrysophanic Acid), **Rhus Toxicodendron** (Toxicodendric Acid).

LEMON.

LIMONIS CORTEX.—Lemon peel. The [rind of the recent fruit of *Citrus Limonum* Risso (nat. ord. *Rutaceæ*). *Habitat.*—Northern India; cultivated in subtropical countries.

CHARACTERS.—In narrow, thin bands or in elliptical segments, with very little of a spongy, white, inner layer adhering to them; outer surface deep lemon-yellow, and ruggedly glandular; odor fragrant; taste aromatic and bitterish.]

COMPOSITION.—The chief constituents are—(1) The official oil, $C_{10}H_{16}$ (*see* below). (2) *Hesperidin*, [$C_{22}H_{26}O_{12}$, a bitter principle.

Lemon Peel is contained in Spiritus Limonis.]

OLEUM LIMONIS.—Oil of Lemon. [A volatile oil obtained by expression from fresh Lemon Peel.

CHARACTERS.—A pale yellow, limpid liquid, having the fragrant odor of lemon, and an aromatic, somewhat bitterish taste. Sp. gr., 0.858 to 0.859. *Solubility.*—In three times its volume of Alcohol; also soluble, in all proportions, in absolute Alcohol, Carbon Disulphide, or glacial Acetic Acid.]

COMPOSITION.—The chief constituents are—(1) *Citrene*, $C_{10}H_{16}$. (2) *Cymene*, $C_{10}H_{14}$. (3) *Citral*, $C_{10}H_{16}O$, an aldehyde.

Oil of Lemon is contained in Spiritus Ammoniæ Aromaticus, and [Spiritus Aurantii Compositus.

Preparation.

Spiritus Limonis.—Spirit of Lemon. *Synonym.*—Essence of Lemon. Oil of Lemon, 50; Lemon Peel, 50; by maceration and filtration with Deodorized Alcohol to 1000.

Spirit of Lemon is contained in Syrupus Acidi Citrici.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.]

Action and Therapeutics.

The same as those of orange. The oil applied externally is rubefacient.

LIMONIS SUCCUS.—Lemon Juice. The freshly expressed juice of the ripe fruit of *Citrus Limonum* [Risso (nat. ord. *Rutaceæ*).]

Characters.—[A slightly turbid, yellowish liquid, usually having an odor of lemon due to the accidental presence of some of the volatile oil of the rind. Taste acid, and often slightly bitter. Sp. gr., not less than 1.030.]

Composition.—Lemon juice contains—(1) *Citric Acid* ($H_3C_6H_5O_7 + H_2O$), about 7 per cent., free, and combined to form Potassium and other salts· [(2) Sugar. (3) Gum. (4) Inorganic Salts.

Dose, 1 to 2 fl. oz.; 30. to 60. c.c.]

Action and Therapeutics.

Lemon juice is used to relieve thirst, and to make effervescing mixtures and drinks. Its action in the body is the same as that of citric acid (*see* p. 239). Three or four ounces [90. or 120. c.c.] of lemon juice daily are of great benefit in scurvy. Why this is we do not certainly know. Lemon juice is probably more efficacious than citric acid.

[PRUNUS VIRGINIANA.

WILD CHERRY.—The bark of *Prunus serotina* Ehrhart (nat. ord. *Rosaceæ*), collected in autumn. *Habitat.*—North America, westward to Minnesota and Louisiana; in woods.

Characters.—In curved pieces or irregular fragments, 2 mm. or more thick, outer surface greenish-brown, or yellowish-brown, smooth and somewhat glossy, marked with transverse scars; if the bark is collected from old wood and deprived of the corky layer, the outer surface is nut-brown and uneven; inner surface somewhat striate or fissured. Upon maceration in water it develops a distinct bitter-almond odor; its taste is astringent, aromatic and bitter.

Composition.—(1) *Amygdalin* (*see* p. 530). (2) *Emulsin*, probably identical with the emulsin of Bitter Almond. In the presence of water by the action of emulsin on amygdalin, the volatile oil, glucose and hydrocyanic acid are formed. The action of this ferment is destroyed at a boiling temperature. (3) Tannic Acid.

Dose, ½ to 1 dr.; 2. to 4. gm.

Preparations.

1. **Extractum Pruni Virginianæ Fluidum.**—Fluid Extract of Wild Cherry. By maceration and percolation with Glycerin, Alcohol and water, and evaporation.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

2. **Infusum Pruni Virginianæ.**—Infusion of Wild Cherry. Wild Cherry, 40. By maceration and percolation to 1000.

Dose, 1 to 2 fl. oz.; 30. to 60. c.c.

3. **Syrupus Pruni Virginianæ.**—Syrup of Wild Cherry. Wild Cherry, 150; sugar, 700; Glycerin, 150; water to 1000. By maceration and percolation.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

THERAPEUTICS.

The same as for diluted hydrocyanic acid (*see* p. 294). It is much used as a remedy for cough, and the syrup, as a vehicle for tincture of digitalis, renders it less likely to produce gastric disturbance.]

BENZOINUM.

BENZOIN.—A balsamic resin obtained from *Styrax Benzoin* [Dryander (nat. ord. *Styraceæ*). *Habitat.*—Sumatra, Java, probably also Siam.

CHARACTERS.—In lumps consisting of agglutinated, yellowish-brown tears, which are internally milk-white, or in the form of a reddish-brown mass, more or less mottled from whitish tears imbedded in it. It is almost wholly soluble in 5 parts of moderately warm Alcohol, and in solutions of the fixed alkalies. When heated, it gives off fumes of Benzoic Acid. It has an agreeable, balsamic odor, and a slight, aromatic taste. *Solubility.*—In 5 parts of Alcohol.] Easily in Ether or Solution of Potassa.

COMPOSITION.—The chief constituents are—(1) *Benzoic Acid* (*see* below), 12 to 20 per cent. (2) *Cinnamic Acid*, $C_9H_8O_2$, a trace. (3) Resin. (4) Volatile Oil.

Preparations.

1. **Adeps Benzo[inatus.**—Benzoinated Lard. Benzoin, 20; Lard, 1000; by melting and straining.

2. **Tinctura Benzoini.**—Tincture of Benzoin. Benzoin, 200; by maceration and filtration with Alcohol to 1000.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

3. **Tinctura Benzoini Composita.**—Compound Tincture of Benzoin. *Synonym.*—Friar's Balsam. Benzoin, 120; Storax, 80; Balsam of Tolu, 40; purified Aloes, 20; by digestion with Alcohol, and filtration to 1000.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.]

advantage is the antiseptic power it possesses. Its stimulating effect is also valuable.

Internal.—*Lungs.*—Benzoin, benzoic acid and its compounds are very commonly employed as stimulating, disinfecting expectorants in cases of bronchitis or phthisis in which the expectoration is foul and scanty. The vapor from a mixture of a pint, [500 c.c] of water at 140° F., [60° C.] and a fluid drachm, [4. c.c.] of compound tincture of benzoin is often inhaled for bronchitis and laryngitis.

Urinary organs.—Benzoic acid is a most valuable drug for acidifying the alkaline decomposing urine which is formed in pyelitis and cystitis, and for stimulating and disinfecting the urinary tract in the same conditions. Ammonium benzoate is so much more soluble than benzoic acid that it is to be preferred to it. Spirit of chloroform covers the taste. It may with advantage be combined with the urinary sedatives, as tincture of hyoscyamus.

[CHRYSAROBINUM.

CHRYSAROBIN. *Synonyms.*—Goa Powder. Araroba Powder. A neutral principle, in its commercial, more or less impure form, extracted from Goa Powder, a substance found deposited in the wood of *Andira Araroba* Aguiar (nat. ord. *Leguminosæ*). *Habitat.*—Brazil.

CHARACTERS.—A pale, orange-yellow, microcrystalline powder, odorless and tasteless; turning brownish-yellow on exposure to air. *Solubility.*—Very slightly soluble in cold water or Alcohol; soluble in 33 parts of boiling Benzol, and in solutions of the alkalies.

COMPOSITION.—The chief constituent is *Chrysarobin*, $C_{27}H_{30}O_{14}$, an orange-yellow crystalline substance, soluble in Alcohol and Ether, more freely soluble in Benzol and Chloroform.] *Synonyms.*—Rhein. Chrysophan (*see* p. 421). In the fresh plant it probably exists as a Glucoside, but this is slowly oxidized into *Chrysophanic Acid*, $C_{15}H_{10}O_4$, and glucose.

Preparation.

Unguentum Chrysarobini.—[Chrysarobin Ointment. Chrysarobin, 5; Benzoinated Lard, 95.]

ACTION.

External.—It is a powerful **irritant** to the skin, which it

stains yellowish-brown. Linen is stained the same color. (The stain may be removed by a weak solution of caustic soda or chlorinated lime.) It is antiparasitic.

Internal.—It is cathartic and very irritating to the stomach and bowels, causing vomiting and purging. It is excreted by the kidneys, and stains the urine yellow.

THERAPEUTICS.

It is used as an antiparasitic in ringworm, and to excite healthy inflammation in chronic cutaneous diseases, especially psoriasis and acne rosacea. It has also been given internally for skin diseases, but as it is so irritating this practice is not advisable.

[RHUS TOXICODENDRON.

RHUS TOXICODENDRON. *Synonyms.* — Poison Ivy. Poison Oak. The fresh leaves of *Rhus radicans* Linné (nat. ord. *Anacardieæ*). *Habitat.*—North America, west to Wyoming and Texas; in thickets.

CHARACTERS.—Long-petiolate, trifoliolate; the lateral leaflets sessile or nearly so, about 10 cm. long, obliquely ovate, pointed; the terminal leaflets stalked, ovate or oval, pointed, with a wedge-shaped or rounded base; the leaflets entire and glabrous, or variously notched, coarsely toothed, or lobed, more or less downy; when dry, papery and brittle; inodorous; taste somewhat astringent and acrid. *Resembling Rhus Toxicodendron.*—The leaves of Ptelea trifoliata, which are similar in appearance, but have all the leaflets sessile.

COMPOSITION.—Its chief constituents are—(1) *Toxicodendric Acid*, a volatile Acid. (2) Tannic Acid. (3) Fixed Oil.

Dose, 1 to 5 gr.; .06 to .30 gm.

USES.

The tincture of the fresh leaves (dose, $\frac{1}{10}$ to 2 m.; .006 to .12 c.c.) has been used in paralysis, noctural incontinence of urine and cutaneous diseases; but the remedy is dangerous and, probably, an useless one, for these purposes. Largely diluted it has been used as a lotion for bruises and burns.]

GROUP XVI.

Vegetable Drugs only used as Flavoring Agents.

Rose, Sugar, Balm, Raspberry, Vanilla, Sage, Oil of Bay, Oil of Sesamum.

ROSA.

ROSA GALLICA.—Red Rose. The petals of *Rosa gallica* [Linné (an old French cultivated before expanding. *Habitat.*—Asia Minor and Southern Europe, cultivated.

CHARACTERS.—Usually in small cones, consisting of numerous imbricated, roundish, somewhat deep purple-colored, yellow-clawed petals, having a sweet odor and a bitterish, slightly acidulous and distinctly astringent taste.

CONSTITUENTS.—The chief constituents are—(1) A volatile oil, a trace. (2) [illegible] (3) Mucilage. (4) Sugar.

[See Pharmacopœias of Dilute Acids et Mucilages.]

Preparations:

1. Confectio Rosæ (Confection of Rose. Red Rose is triturated with Sugar.) 2. Syrupus Rosæ (Syrup of Rose Water, etc.

Dose [illegible]

2. Extractum Rosæ Fluidum.—Fluid Extract of Rose. Is macerated with [illegible] and diluted Alcohol, and evaporated.

Dose [illegible]

3. Mel Rosæ (Honey of Rose. Fluid Extract of Rose in Honey, [illegible].

Dose freely.

4. Syrupus Rosæ (Syrup of Rose. Fluid Extract of Rose in Syrup, etc.

Dose [illegible]

ROSA CENTIFOLIA.—[illegible] Rose. The petals of [illegible] Europe and Asia.—Western Asia, cultivated.

CHARACTERS.—[illegible] and paler colored, rose-pink, rather smaller, and less fragrant and astringent.

CONSTITUENTS.—[illegible] (1) Volatile oil, a trace. (2) Mucilage. (3) [illegible] (4) Mucilage. (5) Tannin.

ROSARUM ROSÆ.—[illegible] Rose. Synonyms.—Attar of Rose. [illegible] Mixture of the Fragrant Flowers of Rosa damascena. Habitat.—Turkey in Bulgaria.

Commercial.—A pale yellow, butyraceous liquid, having the odor

fragrant odor of rose, and a mild, slightly sweetish taste. Sp. gr., 0.865 to 0.880. *Solubility.*—It is but slightly soluble in Alcohol.

COMPOSITION.—Its principal constituents are—(1) *Rhodinal*, $C_{10}H_{18}O$, a volatile oil, 12 to 14 per cent., very fragrant, readily soluble in Alcohol, believed to be identical with Citral. (2) An odorless, solid paraffin hydrocarbon, or Stearopten.

IMPURITIES.—Oil of Ginger-grass or Turkish Oil of Geranium, Oil of Rose Geranium, Spermaceti and Paraffin.]

Preparations.

[1. **Aqua Rosæ Fortior.**—Stronger Rose Water. *Synonym.*—Triple Rose Water. Water saturated with the volatile oil of Rose petals, obtained as a by-product in the distillation of Oil of Rose.

Dose, indefinite.]

2. **Aqua Rosæ.**—[Rose Water. Stronger Rose Water, and distilled water, of each, one volume.

Dose, indefinite.]

[3. **Unguentum Aquæ Rosæ.**—Ointment of Rose Water. *Synonym.*—Cold Cream. Spermaceti, 125; White Wax, 120; Expressed Oil of Almond, 600; Stronger Rose Water, 190; Sodium Borate, 5.]

ACTION AND THERAPEUTICS.

The preparations of rose petals are pleasant vehicles. The infusion (dried petals, 2; diluted sulphuric acid, 1; water, 80) is mildly astringent. [The ointment of rose water is a favorite soothing application for the skin.]

SACCHARUM.

[**SUGAR.**—$C_{12}H_{22}O_{11} = 341.2$. *Synonym.*—Cane Sugar. The refined Sugar obtained from *Saccharum officinarum* Linné, and from various species or varieties of *Sorghum* (nat. ord. *Gramineæ*); also from one or more varieties of *Beta vulgaris* Linné (nat. ord. *Chenopodiaceæ*). *Habitat.*—Southern Asia; cultivated in tropical and subtropical countries.

CHARACTERS.—White, dry, hard, distinctly crystalline granules, odorless, and having a purely sweet taste. Permanent in the air. *Solubility.*—In 0.5 part of water, and in 175 parts of Alcohol; but insoluble in Ether, Chloroform, or Carbon Disulphide.

Dose, indefinite.]

Preparation.

Syrupus.—Syrup. Sugar, 850; distilled water, by solution with heat, and straining to 1000.

Syrup thus prepared has the Sp. gr., 1.317. It is used for compound syrups.

Dose, indefinite.]

ACTION AND THERAPEUTICS.

Sugar is used as a sweetening agent. [Syrup is used as a vehicle.]

[ME A.

MELISSA. *Synonym.*—Balm. leaves and tops of *Melissa officinalis* Linné (nat. ord. *Labiatæ*). *Hab* —Asia Minor, Southern Europe; naturalized in the United States; cultiv

CHARACTERS.—Leaves long, petiolar ovate, obtuse, rounded or subcordate at the base, crenate, somewhat hairy, andular; branches quadrangular; flowers in about four-flowered cymules, ith a tubular, bell-shaped, five-toothed calyx, a whitish or purplish bilabiate corolla, and four stamens; fragrant, aromatic; somewhat astringent and bitterish.

COMPOSITION.—(1) Volatile oil, ¼ per cent. (2) Tannic Acid. (3) Bitter principle.

Dose, 1 to 2 dr.; 4. to 8. gm.

USES.

Balm is used as a flavoring agent.

RUBUS IDÆUS.

RASPBERRY.—The fruit of *Rubus idæus* Linné (nat. ord. *Rosaceæ*). *Habitat.*—Europe and Asia; cultivated.

CHARACTERS.—Deprived of the conical receptacle, and therefore hollow at the base; hemispherical, red, finely hairy, composed of from twenty to thirty coalesced, small drupes, each one crowned with the withered style; juice red; of an agreeable odor, and a pleasant, acidulous taste.

COMPOSITION.—(1) Volatile oil, a trace. (2) Citric and Malic Acids. (3) Sugar, about 5 per cent. (4) Pectin.

Preparation.

Syrupus Rubi Idæi.—Syrup of Raspberry. Fresh ripe raspberries (filtered juice), 40; Sugar, 60.

Dose, indefinite.

USES.

Raspberry syrup is used chiefly as a flavoring agent.

VANILLA.

VANILLA.—The fruit of *Vanilla planifolia* Andrews (nat. ord. *Orchideæ*). *Habitat.*—Eastern Mexico, in hot, damp woods; cultivated in the tropics.

CHARACTERS.—From 15 to 25 cm. long, and about 8 mm. thick, linear, narrowed and bent or hooked at the base, rather oblique at the apex, wrinkled, somewhat warty, dark brown, glossy-leathery, one-celled, and containing a blackish-brown pulp, with numerous, minute seeds, and more or less acicular crystals; odor and taste peculiar, fragrant.

COMPOSITION.—Its chief constituents are—(1) *Vanillin*, $C_8H_8O_3$, a crystalline principle, 1.7 to 2.75 per cent., which develops upon the ripening of the pod. (2) Fixed Oil, 11 per cent. (3) Resin. (4) Sugar. (5) Mucilage. Vanillin is the Aldehyde of Methylprotocatechuic Acid; and can be prepared artificially from Coniferin, Carbolic Acid, Guaiacol and Eugenol, $C_{10}H_{12}O_2$, the last being found in Oil of Cloves, *see* p. 465.

Preparation.

Tinctura Vanillæ.—Tincture of Vanilla. Vanilla, 100; Sugar, 200; by maceration with Alcohol and water to 1000.

Dose, as flavoring agent.

USES.

Vanilla is used solely as a flavoring agent.

SALVIA.

SALVIA. *Synonym.*—Sage. The leaves of *Salvia officinalis* Linné (nat ord. *Labiatæ*). *Habitat.*—Southern Europe; cultivated.

CHARACTERS.—About 5 cm. long, petiolate, ovate-oblong, obtuse or subacute at the apex, rounded or somewhat heart-shaped at the base, finely crenulate, thickish, wrinkled, grayish-green, soft-hairy and glandular beneath; odor aromatic; taste aromatic, bitterish, and somewhat astringent.

COMPOSITION.—It contains—(1) A volatile oil, containing *Salviol*, $C_{10}H_{18}O$, *Cineol* and *Pinene*. (2) Resin. (3) Tannin.

Dose, ¼ to 1 dr.; 1. to 4. gm.

USES.

It is used chiefly as a condiment, and it is said to be useful in checking the perspiration of hectic fever.

OLEUM MYRCIÆ.

OIL OF MYRCIA. *Synonym.*—Oil of Bay. A volatile oil distilled

from the leaves of *Myrcia acris* De Candolle (nat. ord. *Myrtaceæ*). *Habitat.*—West Indies.

CHARACTERS.—A yellow or brownish-yellow liquid, having an aromatic, somewhat clove-like odor, and a pungent, spicy taste. Sp. gr., 0.975 to 0.990. *Solubility.*—With an equal volume of Alcohol, glacial Acetic Acid, or Carbon Disulphide, it yields slightly turbid solutions.

Preparation.

Spiritus Myrciæ.—Spirit Myrcia. *Synonym.*—Bay Rum. Oil of Myrcia, 16; Oil of Oran l, 1; Oil of Pimenta, 1; Alcohol, 1220; water to 2000.

USES.

Oil of myrcia is used solely as a perfume.

OLEUM SESAMI.

OIL OF SESAMUM. *Synonyms.*—Sesame Oil. Teel Oil. Benne Oil. A fixed oil expressed from the seed of *Sesamum indicum* Linné (nat. ord. *Pedali..ceæ*). *Habitat.*—India; cultivated.

CHARACTERS.—A yellowish or yellow, oily liquid, inodorous or nearly so, and having a bland, nut-like taste. Sp. gr., 0.919 to 0.923.

USES.

Benne oil is used in preparing hair oil.

GROUP XVII.

Vegetable drugs used only as coloring agents.

Saffron, Red Saunders.

CROCUS.

[**SAFFRON.**—The stigmas of *Crocus sativus* Linné (nat. ord. *Irideæ*). *Habitat.*—Western Asia; cultivated in Spain and France.

CHARACTERS.—Separate stigmas, or three, attached to the top of the style, about 3 cm. long, flattish-tubular, almost thread-like, broader and notched above; orange-brown; odor strong, peculiar, aromatic; taste bitterish and aromatic.]

COMPOSITION.—The chief constituents are—(1) *Polychroit*, [$C_{44}H_{70}O_{28}$, an amorphous, brown-yellow Glucoside, soluble in Alcohol and water, splitting into sugar (*Crocose*), and red *Crocetin* (formerly called *Crocin*) $C_{24}H_{38}O_9$, soluble in Ether and Alcohol. (2) *Picrocrocin*, $C_{38}H_{66}O_{17}$, in colorless, bitter

needles, readily soluble in Alcohol and water. (3) A volatile oil, $C_{10}H_{16}$, 1 per cent. (4) Fixed oil.]

IMPURITIES.—Marigold, saffron petals, chalk, and oil.

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparation.

Tinctura Croci.—[Tincture of Saffron. Saffron, 100; by maceration and percolation with diluted Alcohol to 1000.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.]

ACTION AND THERAPEUTICS.

Saffron is only used to color [pharmaceutical] preparations.

SANTALUM RUBRUM.

[**RED SAUNDERS.**—The wood of *Pterocarpus santalinus* Linné filius (nat. ord. *Leguminosæ*). *Habitat.*—Madras; cultivated.

CHARACTERS.—A hard, heavy, dark reddish-brown, coarsely splintery wood, deprived of the light-colored sap-wood; usually met with in chips, or as a coarse, irregular, brownish-red powder, nearly inodorous and nearly tasteless. *Resembling Red Saunders.*]—Logwood, which is less dense.

COMPOSITION.—The chief constituents are—[(1) *Santalin*, $C_{15}H_{14}O_5$, in red needles. (2) *Santal*, $C_8H_6O_3$, in colorless scales. (3) *Pterocarpin*, $C_{20}H_{16}O_6$. (4) *Homopterocarpin*, $C_{24}H_{24}O_6$, in colorless crystals.]

Red Saunders is contained in Tinctura Lavandulæ Composita.

ACTION AND THERAPEUTICS.

Red Saunders is used to color preparations, but is of no value medicinally.

GROUP XVIII.

Vegetable substances whose action is mechanical.

Cotton, Pyroxylin, Oil of Theobroma, Mastic, India-rubber, Benzin, Carbon Disulphide, Starch, Lycopodium, Quillaja.

GOSSYPIUM PURIFICATUM.

[**PURIFIED COTTON.** *Synonym.*—Absorbent cotton. The hairs of the seed of *Gossypium herbaceum* Linné, and of other species of *Gossypium* (nat. ord. *Malvaceæ*), freed from adhering impurities, and deprived of fatty matter. *Habitat.*—Tropical Asia and Africa; cultivated in tropical and subtropical countries.

CHARACTERS.—White, soft, fine filaments, appearing under the microscope as hollow, flattened and twisted bands, spirally striate, and slightly thickened at the edges; inodorous and tasteless; insoluble in ordinary solvents, but soluble in Copper Ammonium Sulphate solution.]

PYROXYLINUM.—Pyroxylin. *Synonyms.*— Gun Cotton. [Soluble Gun Cotton. Calloxylin. Purified Cotton, 100; is immersed in a mixture of Sulphuric, 2200; and Nitric Acids, 1400; washed with a large quantity of water, drained and dried, then dissolved in Alcohol, 1 volume; and Ether, 3 volumes.

Preparations.

1. **Collodium.**—Collodion. Pyroxylin, 30; dissolved in Ether, 750; and Alcohol, 250.

2. **Collodium Flexile.**—Flexible Collodion. Collodion, 920; Canada Turpentine, 50; Castor Oil, 30.

3. **Collodium Cantharidatum.**—Cantharidal Collodion. *Synonym.*—Blistering Collodion. Cantharides, 60; by percolation with Chloroform, evaporation and solution of residue in Flexible Collodium, 85.

4. **Collodium Stypticum.**—*See* Tannic Acid, p. 515.]

ACTION AND THERAPEUTICS.

The use[s] of cotton [are] well known. Pyroxylin is only used to make collodion. Collodion, when painted on the skin, rapidly dries from evaporation of the ether, and covers the skin with a thin protective film. Collodium Flexile has the same properties, but it does not crack, as collodion often does. These preparations are protective to small wounds, and are used after slight operations.

[OLEUM GOSSYPII SEMINIS.

COTTON SEED OIL.—A fixed oil expressed from the seed of *Gossypium herbaceum* Linné, and other species of *Gossypium* (nat. ord. *Malvaceæ*), and subsequently purified. *Habitat.*—Asia and Africa; cultivated.

CHARACTERS.—A pale yellow, oily liquid, without odor, and having a bland, nut-like taste and neutral reaction. Sp. gr., 0.920 to 0.930. *Solubility.*—Slightly soluble in Alcohol, but readily soluble in Ether, Chloroform, or Carbon Disulphide.

COMPOSITION.—(1) *Olein.* (2) *Palmitin.* (3) Coloring matter.

Cotton Seed Oil is used in Linimentum Ammoniæ and Linimentum Camphoræ.

Uses.

Cotton Seed Oil is used simply as a bland, nutritious oil, and in liniments.]

OLEUM THEOBROMATIS.

OIL OF THEOBROMA. *Synonym.*—Butter of Cacao. [A fixed oil expressed from the seed of *Theobroma Cacao* Linné (nat. ord. *Sterculiaceæ*). *Habitat.*—South America.

Characters.—A yellowish-white solid, having a faint, agreeable odor, and a bland, chocolate-like taste. Sp. gr., 0.970 to 0.980. *Solubility.*—Readily in Ether or Chloroform; also soluble in 100 parts of Alcohol.

Composition.—The chief constituents are—(1) *Stearin.* (2) *Laurin.* (3) *Arachin.* (4) *Olein.* (5) Formic, Acetic and Butyric Acid Glycerides.]

Uses.

Oil of theobroma is used to make suppositories, [and as a source of stearic acid.]

MASTICHE.

MASTIC.—A concrete resinous exudation from *Pistacia Lentiscus* [Linné (nat. ord. *Anacardieæ*). *Habitat.*—Mediterranean basin.]

Characters.—[Globular or elongated tears, of about the size of a pea, sometimes covered with a whitish dust, pale yellow, transparent, having a glass-like lustre and a opalescent refraction; brittle; becoming plastic when chewed; of a weak, somewhat balsamic, resinous odor, and a mild terebinthinate taste. *Solubility.*—Completely in Ether, and, for the most part, soluble in Alcohol.] *Resembling Mastic.*—Acacia, which is larger, rougher, and more opaque.

Composition.—The chief constituents are—(1) A Resin, [$C_{20}H_{32}O_2$,] *Mastichic Acid*, 90 per cent.; soluble in Alcohol. (2) *Masticin*, a resin, [insoluble in Alcohol. (3) Volatile oil, $C_{10}H_{16}$, 1 to 2 per cent.

Impurity.—Sandarac.

Preparation.

Pilulæ Aloes et Mastiches.—*See* Aloes, p. 429.]

Uses.

[Mastic is a mild stimulant, mostly used as a masticatory, for filling decayed teeth, and for cements and varnishes.]

[ELASTICA.

INDIA-RUBBER. *Synonym.*—Caoutchouc. The prepared milk-juice of various species of *Hevea* (nat. ord. *Euphorbiaceæ*), known in commerce as Para Rubber. *Habitat.*—In tropical countries.

CHARACTERS.—In cakes, balls, or hollow, bottle-shaped pieces, externally brown to brownish-black, internally brownish or of lighter tint; very elastic. *Solubility.*—Insoluble in water, diluted acids, or diluted solutions of alkalies; soluble in Chloroform, Carbon Disulphide, Oil of Turpentine, Benzin, and Benzol. When heated to about 257° F.; 125° C., it melts, remaining soft and adhesive after cooling. Odor faint, peculiar; nearly tasteless.

COMPOSITION.—(1) A solid Hydrocarbon, $C_{20}H_{32}$. (2) Fat. (3) Volatile oil. (4) Coloring matters. On combining it with 10 per cent of Sulphur, Vulcanized Rubber is obtained; with 50 per cent., and hardening by pressure, Vulcanite or Ebonite is produced.

USES.

India-rubber is used for making plasters, bougies, pessaries, and syringes.

BENZINUM.

BENZIN. *Synonyms.*—Petroleum Benzin. Petroleum Ether. A purified distillate from American Petroleum, consisting of hydrocarbons, chiefly of the marsh-gas series (C_5H_{12}, C_6H_{14}, and homologous compounds).

CHARACTERS.—A transparent, colorless, diffusive liquid, of a strong, characteristic odor, slightly resembling that of Petroleum, but much less disagreeable, and having a neutral reaction. Sp. gr., 0.670 to 0.675. *Solubility.*—Insoluble in water; soluble in about 6 parts of Alcohol, and readily soluble in Ether, Chloroform, Benzol, fixed and volatile oils.

USES.

Benzin is used to obtain volatile oils by percolation, as a substitute for ether in making oleoresins, for dissolving fats, resins, caoutchouc and some of the alkaloids.

CARBONEI DISULPHIDUM.

CARBON DISULPHIDE.—$CS_2 = 75.93$. *Synonym.*—Carbonei Bisulphidum.

SOURCE.—By combination of Carbon and Sulphur, by distillation.

CHARACTERS.—A clear, colorless, highly refractive liquid, very diffusive, having a strong characteristic, but not fetid odor, and a sharp, aromatic taste. *Solubility.*—In 535 parts of water; very soluble in Alcohol, Ether, Chloroform, fixed and volatile oils. Sp. gr., 1.268 to 1.269.

USES.

Carbon disulphide is used as a solvent. It is the best sol-

vent for rubber and similar bodies. It can be freed from its usual disgusting odor by repeated rectification.]

AMYLUM.

STARCH.—[The fecula of the seed of *Zea Mays* Linné (nat. ord. *Gramineæ*). *Habitat.*—Tropical Asia and Africa; cultivated in tropical and subtropical countries.

CHARACTERS.—In irregular, angular masses, which are easily reduced to a fine powder; white, inodorous, and tasteless; insoluble in Ether, Alcohol, or cold water. Under the microscope appearing as granules, nearly uniform in size, more or less angular in outline, with indistinct striæ and with a distinct hilum near the centre.

COMPOSITION.—Its ultimate composition is $C_6H_{10}O_5$, but it consists of a mixture of various modifications of Starch-cellulose and Starch-granulose.]

Preparation.

Glyceri[tum Amyli.—*See* Glycerin, p. 527.]

ACTION AND THERAPEUTICS.

Starch is chiefly employed for its mechanical properties, on account of which it is used as a basis for dusting powders and insufflations. The glycerite is a basis for suppositories; the mucilage [B. P., 1 to 40] is a basis for ointments, and may be used to suspend insoluble powders or oils.

[LYCOPODIUM.

LYCOPODIUM. *Synonym.*—Vegetable Sulphur. The spores of *Lycopodium clavatum* Linné, and of other species of *Lycopodium* (nat. ord. *Lycapodiaceæ*). *Habitat.*—Europe, Asia, and North America, in dry woods.

CHARACTERS.—A fine powder, pale yellowish, very mobile, inodorous, tasteless, floating upon water and not wetted by it, but sinking on being boiled with it, and burning quickly when thrown into a flame. Under the microscope the spores are seen to be sphæro-tetrahedral, the surfaces marked with reticulated ridges, and the edges beset with short projections.

COMPOSITION.—(1) Fixed oil, 47 to 49 per cent. (2) Cane Sugar, 2 per cent. (3) A volatile base, Methylamine, in minute quantities.

IMPURITIES.—Pollen, starch and sand.

ACTION AND THERAPEUTICS.

Lycopodium has a great power of absorbing oils and olco-

resins. It is excellent as a basis of pills, especially as it protects hygroscopic substances, for it is powerfully repellant to water. It is useful as a dusting powder, and also as a basis for insufflations.

QUILLAJA.

QUILLAJA. *Synonyms.*—Quillaia. Soap Bark. The inner bark of *Quillaja Saponaria* Molina (nat. ord. *Rosaceæ*). *Habitat.*—Chili and Peru.

CHARACTERS.—Flat, large pieces, about 5 mm. thick; outer surface brownish-white, often with small patches of brown cork attached, otherwise smooth; inner surface whitish, smooth; fracture splintery, checkered with pale, brownish bast fibres imbedded in white tissue; inodorous; taste presistently acrid; the dust very sternutatory.

COMPOSITION.—(1) *Saponin*, about 9 per cent., a mixture of the Glucosides, *Quillaic Acid*, $C_{19}H_{30}O_{10}$, and *Sapotoxin*, $C_{17}H_{26}O_{10}$.

Dose, ¼ to ½ dr.; 1. to 2. gm.

Preparation.

Tinctura Quillajæ.—Tincture of Quillaja. Quillaja, 200; by boiling with water, straining and washing, addition of Alcohol, 350; filtration and water to 1000.

Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

USES.

Quillaja imparts a soapy character to cold water, and has been much used to infuse oily liquids through water. The tincture has been used as an expectorant, when a pleasant remedy is desired. It does not provoke diarrhœa or vomiting, and has a somewhat sweetish, rather agreeable taste.]

GROUP XIX.

Vegetable substances [acting on Metabolism.]

Guaiacum, Xanthoxylum, Sarsaparilla, Menispermum, Stillingia, Lappa, Sassafras, Calendula.

GUAIACUM.

GUAIACI LIGNUM.—Guaiacum Wood. *Synonym.*—Lignum vitæ. The heart-wood of *Guaiacum officinale* [Linné, and of *Guaiacum sanctum* Linné (nat. ord. *Zygophylleæ*). *Habitat.*—West Indies, North and South America.

CHARACTERS.—Heavier than water, hard, brown or greenish-brown, resinous, marked with irregular, concentrated circles, surrounded by a yellowish alburnum, splitting irregularly; when heated, emitting a balsamic odor; taste slightly acrid. Guaiacum Wood is generally used in the form of raspings or turnings, which should be greenish-brown, containing few particles of a whitish color, and should acquire a dark bluish-green color on the addition of Nitric Acid.]

COMPOSITION.—The principal constituent is the *Resin* (*see* below), 20 to 25 per cent.

Guaiacum Wood is used to make Decoctum Sarsaparillæ Compositum.

Dose, ¼ **to 1 dr.; [1. to 4. gm.]**

GUAIACI RESINA.—Guaiac. [*Synonym.*—Gum Guaiac. The resin of the wood of *Guaiacum officinale* Linné (nat. ord. *Zygophylleæ*).

SOURCE.—By melting the resin of the heartwood with fire.

CHARACTERS.—In irregular masses, or subglobular pieces, externally greenish-brown, internally of a glassy lustre, and, in recent Guaiac, usually reddish-brown, transparent in thin splinters, fusible, feebly aromatic, the odor becoming stronger in heating; taste somewhat acrid; powder grayish, turning green on exposure to air.] Guaiacum Resin on dry distillation yields *Guaiacol*, also found in Creosote (*see* p. 286). *Resembling Guaiacum Resin.*—Myrrh, Scammony, Benzoin, Aloes, and Resin, but these have no greenish tinge.

COMPOSITION.—The chief constituents are—(1) *Guaiaconic Acid*, $C_{19}H_{20}O_5$ (70 per cent.). (2) *Guaiacic Acid.* (3) *Guaiaretic Acid*, [$C_{20}H_{26}O_4$ (about 10 per cent.).] These are insoluble in water, but soluble in alkalies. (4) Gum, a small quantity.

INCOMPATIBLES.—Mineral acids and Spirit of Nitrous Ether.

[*Guaiac Resin is contained in* Pilulæ Antimonii Compositæ.]

Dose, 5 to 30 gr.; [.30 to 2.00 gm.]

Preparations.

[1. **Tinctura Guaiaci.**—Tincture of Guaiac. Guaiac, 200. By maceration with Alcohol and filtration to 1000.

Dose, ½ **to 1 fl. dr.; 2. to 4. c.c.]**

2. **Tinctura Guaiaci Ammoniata.**—[Ammoniated Tincture of Guaiac. Guaiac, 200; by maceration with Aromatic Spirit of Ammonia, and filtration to 1000.

Dose, ½ **to 1 fl. dr.; 2. to 4. c.c.]**

ACTION.

External.—None.

Internal.—Guaiacum resin gives rise to an acrid feeling in

the throat and a sensation of heat in the epigastrium. It increases the secretions and movements of the intestine and stomach. Large doses are gastro-intestinal irritants, causing vomiting and purging. It reflexly stimulates the heart.

THERAPEUTICS.

Internal.—Guaiacum resin is so [disagreeable] and its value so doubtful that it is rarely ordered. It is used empirically, sometimes successfully, for chronic sore throat, especially if the subject has had syphilis. Lozenges (2 gr. [.12 gm.] of the resin with black currant paste) are prepared. The mixture is said to be a more efficacious preparation than that of the tincture. Thirty grains [2. gm.] of the powder itself may be placed on the back of the throat and swallowed. Guaiacum is a mild purgative, and it has been given as a pill in chronic constipation; it was formerly employed in chronic rheumatism.

[XANTHOXYLUM.

XANTHOXYLON. *Synonym.*—Prickly Ash Bark. The bark of *Xanthoxylum americanum* Miller, and of *Xanthoxylum Clava-Herculis* Linné (nat. ord. *Rutaceæ*). *Habitat.*—North America.

CHARACTERS.—*Xanthoxylum americanum* (Northern Prickly Ash) is in curved or quilled fragments, about 1 mm. thick; outer surface brownish-gray, with whitish patches, and minute, black dots, faintly furrowed, with some brown, glossy, straight, two-edged spines, linear at the base, and about 5 mm. long; inner surface whitish, smooth; fracture short, non-fibrous, green in the outer and yellowish in the inner layer; inodorous; taste bitterish, very pungent.

Xanthoxylum Clava-Herculis (Southern Prickly Ash) resembles the preceding but is about 2 mm. thick, and is marked by many conical, corky projections, sometimes 2 cm. high, and by stout, brown spines, rising from a corky base. *Resembling Xanthoxylum.*—Aralia spinosa, which is nearly smooth externally, and beset with slender prickles in transverse rows.

COMPOSITION.—It contains—(1) An acrid, green oil. (2) A Resin, crystalline, white and tasteless. (3) An acrid, soft resin. (4) A bitter substance, probably an alkaloid. (5) Tannin, in small quantity.

Dose, 10 to 30 gr.; .60 to 2.00 gm.

Preparation.

Extractum Xanthoxyli Fluidum.—Fluid Extract of Xanthoxylum. By maceration and percolation with Alcohol, and evaporation.

Dose, 10 to 30 m.; .60 to 2.00 c.c.

Action and Uses.

Xanthoxylum has about the same action as guaiac. It produces, when swallowed, a sensation of heat. It enjoys some reputation as a remedy for chronic rheumatism, and has been used in syphilis and chronic hepatic disorders. Used as a masticatory, it is a popular remedy for tooth-ache.]

SARSAPARILLA.

SARSA[PARILLA. The root of *Smilax officinalis* Kunth, *Smilax medica* Chamisso et Schlechtendal, *Smilax papyracea* Duhamel, and of other undetermined species of *Smilax* (nat. ord. *Liliaceæ*). *Habitat.*—Tropical America, from Mexico to Brazil.

Characters.—About 4 or 5 mm. thick, very long, cylindrical, longitudinally wrinkled, externally grayish-brown or orange-brown; internally showing a whitish and mealy, or somewhat horny, cortical layer, surrounding a circular wood-zone, the latter enclosing a broad pith; nearly inodorous; taste mucilaginous, bitter, and acrid.] *Resembling Sarsaparilla.*—Senega, which is twisted and keeled; Hemidesmus, which is cracked transversely.

Composition.—The chief constituents are—(1) *Parillin* [also named *Smilacin, Parillinic Acid and Pariglin*, about 0.2 per cent., an acrid glucoside, soluble in hot water and Alcohol, insoluble in Ether], closely resembling Saponin. (2) Resin. (3) Trace of a Volatile Oil. [(4) Calcium Oxalate and other salts.]

Incompatibles.—Alkalies.

Dose, ½ to 1 dr.; [2. to 4 gm.]

Preparations.

1. **Decoctum Sarsa[parillæ Compositum.**—Compound Decoction of Sarsaparilla. Sarsaparilla, 100; Sassafras, 20; Guaiacum, Wood, 20; Glycyrrhiza, 20; Mezereum, 10. By boiling, maceration in water and straining to 1000.

Dose, 1 to 4 fl. oz.; 30. to 120. c.c.]

2. **Extractum Sarsa[parillæ Fluidum.**—Fluid Extract of Sarsaparilla. By maceration and percolation with Alcohol and water, and evaporation.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.]

3. **Extractum Sarsa[parillæ Fluidum Compositum.**—Compound Fluid Extract of Sarsaparilla. Sarsaparilla, 750; Glycyrrhiza, 120; Sassafras, 100; Mezereum, 30. By maceration and percolation in Glycerin, Alcohol and water, and evaporation, to 1000.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

4. **Syrupus Sarsaparillæ Compositus.**—Compound Syrup of Sarsaparilla. Fluid Extract of Sarsaparilla, 200; Fluid Extract of Glycyrrhiza, 15; Fluid Extract of Senna, 15; Oil of Sassafras, $\frac{1}{10}$; Oil of Anise, $\frac{1}{10}$; Oil of Gaultheria, $\frac{1}{10}$; sugar, 650. By mixing, filtering, dissolving the sugar, and straining with water to 1000.

Dose, ½ to 1 fl. oz.; 8. to 30. gm.]

Action and Therapeutics.

Sarsaparilla is not known to have any physiological action. It is never given alone, therefore we are ignorant of its therapeutical effects. Probably it has none.

[MENISPERMUM.

MENISPERMUM. Canadian Moonseed. *Synonym*—Yellow Parilla. The rhizome and roots of *Menispermum canadense* Linné (nat. ord. *Menispermaceæ*). *Habitat.*—North America, in moist thickets.

Characters.—Rhizome several feet long, about 5 mm. thick, brown or yellowish-brown, somewhat knotty, finely wrinkled, longitudinally and beset with numerous thin, rather brittle roots; fracture tough, woody; internally yellowish, the bark rather thick, the wood-rays broad, porous, and longest on the lower side; pith distinct; nearly inodorous; taste bitter.

Composition.—The chief constituents are—(1) *Menispine*, a white alkaloid, insoluble in Benzol and alkalies. (2) *Berberine* (*see* p. 413.) (3) Tannin (4) Resin.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

Preparation.

Extractum Menispermi Fluidum.—Fluid Extract of Menispermum. By maceration and percolation with Alcohol and water, and evaporation.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

Uses.

The uses of Menispermum are similar to those of Sarsaparilla.

STILLINGIA.

STILLINGIA. *Synonyms.*—Queen's Root. Queen's Delight. The root of *Stillingia sylvatica* Linné (nat. ord. *Euphorbiaceæ*). *Habitat.*—Southern United States, in sandy soil.

Characters.—About 30 cm. long, and nearly 5 cm. thick, subcylindrical, slightly branched, compact, wrinkled, tough, grayish-brown, breaking with a

fibrous fracture, showing a thick bark and porous wood, the inner bark and medullary rays having numerous yellowish-brown resin-cells; odor peculiar, unpleasant; taste bitter, acrid, and pungent.

COMPOSITION.—(1) *Sylvacrol*, an acrid resin, soluble in Alcohol and Chloroform. (2) Probably a glucoside. (3) Resin. (4) Volatile Oil. (5) Tannin.

Dose, ¼ to 1 dr.; 1. to 4. gm.

Preparations.

Extractum Stillingiæ Fluidum.—Fluid Extract of Stillingia. By maceration and percolation with diluted Alcohol and evaporation.

Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.

ACTION AND USES.

Stillingia is in large doses emetic and cathartic, but in smaller ones, alterative. It is a valuable remedy in syphilis and in the cutaneous and hepatic diseases which are benefited by so-called alterative medicines.

LAPPA.

LAPPA. *Synonym.*—Burdock. The root of *Arctium Lappa* Linné and some other species of *Arctium* (nat. ord. *Compositæ*). *Habitat.*—Europe and Northern Asia; naturalized in North America, in waste places.

CHARACTERS.—About 30 cm. or more long, and, in its thickest portion, from 1 to 2 cm. thick; nearly simple, fusiform, fleshy, longitudinally wrinkled, crowned with a tuft of whitish, soft, hairy leaf-stalks; grayish-brown, internally paler; fracture somewhat horny; bark rather thick, the inner part and the wood radially striate, the parenchyma free from starch,—often with cavities lined with white remains of tissue; odor feeble and unpleasant; taste mucilaginous, sweetish and somewhat bitter.

COMPOSITION.—The chief constituents are—(1) Inulin. (2) Possibly a glucoside. (3) Resin. (4) Tannic Acid, in small quantity.

Dose, ½ to 1 dr.; 2. to 4. gm.

Preparation.

Extractum Lappæ Fluidum.—Fluid Extract of Lappa. By maceration and percolation with diluted Alcohol, and evaporation.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

ACTION AND USES.

Burdock is considered to be a diuretic and diaphoretic alter-

ative. It has been recommended in the treatment of various chronic skin diseases, especially in psoriasis and acne.]

SASSAFRAS.

SASSAFRAS.—[The bark of the root of *Sassafras variifolium* (Salisbury) O. Kuntze (nat. ord. *Laurineæ*). *Habitat.*—North America from Eastern Texas and Kansas eastward to Florida and Ontario; in woods.

CHARACTERS.—In irregular fragments, deprived of the gray, corky layer; bright rust-brown, soft, fragile, with a short, corky fracture; the inner surface smooth; strongly fragrant; taste sweetish, aromatic, and somewhat astringent.

COMPOSITION.—The chief constituents are—(1) A volatile oil (*see* below), about 5 per cent. (2) Sassafrid, a peculiar decomposition product of Tannic Acid. (3) Resin. (4) Tannic Acid.]

Sassafras is contained in Decoctum Sarsa[parillæ Compositum, and Extractum Sarsaparillæ Fluidum Compositum.

Dose, ¼ to 1 dr.; 1. to 4. gm.]

SASSAFRAS MEDULLA.—Sassafras Pith. The pith of *Sassafras variifolium* (Salisbury) O. Kuntze (nat. ord. *Laurineæ*).

CHARACTERS.—In slender, cylindrical pieces, often curved or coiled, light, spongy, white, inodorous and insipid. Macerated in water it forms a mucilaginous liquid, which is not precipitated on the addition of Alcohol.

Preparation.

Mucilago Sassafras Medullæ.—Mucilage of Sassafras Pith. Sassafras Pith, 2; water, 100. By maceration and straining.

Dose, freely.

OLEUM SASSAFRAS.—Oil of Sassafras. A volatile oil distilled from Sassafras.

CHARACTERS.—A yellowish or reddish-yellow liquid, having the characteristic odor of Sassafras without the odor of Camphor, and a warm, aromatic taste. It becomes darker and thicker by age and exposure to the air. Sp. gr., 1.070 to 1.090. *Solubility.*—Soluble, in all proportions, in Alcohol, in Glacial Acetic Acid, and in Carbon Disulphide.

Oil of Sassafras is contained in [Syrupus Sarsaparillæ Compositus.

Dose, 1 to 5 m.; .06 to .30 c.c.]

ACTION AND THERAPEUTICS.

The external and internal action of sassafras is, so far as is known, the same as that of volatile oils generally. The mucilage is somewhat stimulant in its action, and is an excellent vehicle.

[CALENDULA.

CALENDULA. *Synonym.*—Marigold. The florets of *Calendula officinalis* Linné (nat. ord. *Compositæ*). *Habitat.*—Levant and Southern Europe; cultivated.

CHARACTERS.—Florets about 12 mm. long, linear and strap-shaped, delicately veined in a longitudinal direction, yellow or orange-colored, three-toothed above, the short hairy tube enclosing the remnants of a filiform style terminating in two elongated branches; odor slight and somewhat heavy; taste somewhat bitter and faintly saline.

COMPOSITION.—The chief constituents are—(1) A peculiar principle, *Calendulin*, which is regarded as analogous to Bassorin. (2) An amorphous bitter principle. (3) Gum.

Dose, 15 to 60 gr.; 1. to 4. gm.

Preparation.

Tinctura Calendulæ.—Tincture of Calendula. Calendula, 200. By maceration and percolation with Alcohol to 1000.

Dose, 1 to 4 fl. dr.; 4. to 15. c.c.

USES.

Calendula was formerly supposed to be antispasmodic, sudorific and emmenagogue, but now is believed to have no therapeutic value.]

SECTION II.—PHARMACOPŒIAL SUBSTANCES DERIVED FROM THE ANIMAL KINGDOM.

MOSCHUS.

MUSK.—The dried secretion from the preputial follicles of *Moschus moschiferus* [Linné (class *Mammalia;* order *Ruminantia*). *Habitat.*—Central Asia.

CHARACTERS.—In irregular, crumbly, somewhat unctuous grains, dark reddish-brown, having a peculiar, penetrating and persistent odor, and a bitterish taste. It is contained in oval or roundish sacs about 4 to 5 cm. in diameter, on one side invested with a smoothish membrane, on the other side covered with stiff, appressed, grayish hairs, concentrically arranged around two orifices near the centre. *Solubility.*—About 10 per cent. of Musk is soluble in Alcohol, the tincture being light brownish-yellow, and on the addition of water becoming slightly turbid. About 50 per cent. of Musk is soluble in water, the solution being deep brown, faintly acid, and strongly odorous.

COMPOSITION.—(1) Ammonia. (2) An acid. (3) Cholesterin. (4)

Dose, ¼ to 1 fl. dr.; 1. to

ACTIC

Musk is a very powerful **diffus** the heart and nervous system. H also stimulates the respiratory cent headache and nausea.

THERAPEU

It has been used, and apparentl collapse and prostration of long-cor as typhoid fever and pneumonia. diseases, as hysteria, are occasionall price limits its use. It is usually giv

SEVUM.

SUET. [*Synonym.*—Mutton Suet. of *Ovis Aries* Linné (class *Mammalia;* orde ing and straining. *Habitat.*—Domesticated.

CHARACTERS.—A white, solid fat, nearl taste when fresh, but becoming rancid on *Solubility.*—Insoluble in water or cold Alco Ether, and slowly in 2 parts of B--

[ACIDUM STEARICUM.

STEARIC ACID.—$HC_{18}H_{35}O_2 = 283.38$.

SOURCE.—An organic acid, in its commercial, more or less impure form, usually obtained from the more solid fats, chiefly tallow. By boiling with soda-lye, the Stearin is decomposed, Sodium Stearate being formed with the liberation of Glycerin. $C_3H_5(C_{18}H_{35}O_2)_3 + 3NaOH = C_3H_5(OH)_3 + 3NaC_{18}H_{35}O_2$. The soap is decomposed by heating with water and Sulphuric Acid, setting free the fatty acids which are removed and purified with hot Alcohol. On cooling, Stearic Acid will separate.

CHARACTERS.—A hard, white, somewhat glossy solid, odorless and tasteless, and permanent in the air. *Solubility.*—Insoluble in water; soluble in about 45 parts of Alcohol at 59° F.; 15° C., readily soluble in boiling Alcohol, and in Ether.

USES

Stearic acid is used in the manufacture of glycerin suppositories. In combination with zinc and copper, as stearates of those metals, unofficial preparations have been introduced and used with success in the treatment of various diseases of the skin.]

ADEPS LANÆ HYDROSUS.

HYDROUS WOOL-FAT. *Synonyms.*—Lanolin. [Œsypum. The purified fat of the wool of sheep (*Ovis Aries* Linné; class *Mammalia*; order *Ruminantia*), mixed with not more than 30 per cent. of water. *Habitat.*—Domesticated.

SOURCE.—Sheep's wool is treated with a weak soda solution, and the solution acidulated. The remaining wool is treated with Benzin, the liquid distilled, and the residue deprived of color by oxidizing agents, or sunlight.

CHARACTERS.—A yellowish-white or nearly white, ointment-like mass, having a faint, peculiar odor. *Solubility.*—Insoluble in water, but miscible with twice its weight of the latter, without losing its ointment-like character.

COMPOSITION.—Its chief constituents are—(1) *Cholesterin*, $C_{26}H_{43}(OH)$. (2) Ethers of Stearic, Palmitic, Oleic, Valerianic and other acids.]

ACTION AND THERAPEUTICS.

Hydrous wool-fat when gently rubbed in the skin is more quickly absorbed than most fats, hence it is a useful basis if we wish to administer substances—as, for example, mercury—by inunction. [It is undoubtedly soothing to the skin, and often makes an excellent basis for ointments expected to act especially upon the skin.]

[ICHTHYOCOLLA.

ISINGLASS.—The swimming-bladder of *Acipenser Huso* Linné, and of other species of *Acipenser* (class *Pisces;* order *Sturiones*). *Habitat.*—Caspian and Black Seas and tributary rivers.

CHARACTERS.—In separate sheets, sometimes rolled, of a horny or pearly appearance; whitish or yellowish, semi-transparent, iridescent, inodorous, and insipid. *Solubility.*—Almost entirely soluble in boiling water and in boiling diluted Alcohol. A solution of Isinglass in 24 parts of boiling water forms, on cooling, a transparent jelly.

COMPOSITION.—(1) *Gelatin* (Glutin), 98 per cent. (2) Insoluble membrane, 2 to 30 per cent.

Dose, freely.

Preparation.

Emplastrum Ichthyocollæ.—Isinglass plaster. *Synonym.*—Court plaster. Isinglass, 10; Alcohol, 40; Glycerin, 1; hot water, sufficient for solution. To be applied with a brush upon taffeta, previously coated on the back with Tincture of Benzoin.

USES.

Isinglass is an emollient and nutritive substance, and is chiefly used externally as a protective.]

SACCHARUM LACTIS.

SUGAR OF MILK. *Synonym.*—Lactose. $C_{12}H_{22}O_{11}[+H_2O=359.16$. A peculiar, crystalline sugar, obtained from the whey of cow's milk by evaporation, and purified by recrystallization.

CHARACTERS.—White, hard, crystalline masses, yielding a white powder feeling gritty on the tongue, odorless and having a faintly sweet taste. Permanent in the air. *Solubility.*—In about 6 parts of water; insoluble in Alcohol, Ether or Chloroform.]

Sugar of Milk is used in [Pulvis Ipecacuanhæ et Opii and Trituratio Elaterini.

Dose, indefinite.]

[USES.]

Sugar of milk is used in triturations and as a vehicle. It is a non-nitrogenous, bland article of diet and has been used in consumption and other wasting diseases. [According to Sée, it is a diuretic which may be employed to advantage in cardiac dropsy.]

FEL BOVIS.

[**OXGALL.** *Synonym.*—Fel Tauri. The fresh bile of *Bos Taurus* Linné (class *Mammalia;* order *Ruminantia*). *Habitat.*—Domesticated.

CHARACTERS.—A brownish-green or dark green, somewhat viscid liquid, having a peculiar, unpleasant odor, and a disagreeable, bitter taste. Sp. gr., 1.018 to 1.028.

Dose, 5 to 15 gr.; .30 to 1.00 gm.]

Preparation.

Fel Bovi[s Purificatum.—Purified Oxgall.

SOURCE.—Evaporate Oxgall, 300, to 100; add Alcohol, 100. Decant, filter, and after distillation of the Alcohol, evaporate.

CHARACTERS.—A yellowish-green, soft solid, having a peculiar odor, and a partly sweet and partly bitter taste. *Solubility.*—Very soluble in water and in Alcohol.

Dose, 5 to 15 gr.; .30 to 1.00 gm.]

ACTION AND THERAPEUTICS.

Oxgall has been used as a cholagogue purgative in cases of constipation, in which the pale color of the fæces indicates a deficient secretion of bile. [It has also been used as an antiseptic in typhoid fever and in intestinal fermentation.] An enema of twenty grains [1.20 gm.] or more of it dissolved in an ounce or two [30. to 60. c.c.] of water is very useful in case of impacted fæces, in which the rectum is so full that there is not sufficient room for a larger enema. [One to two ounces; 30. to 60. gm. of oxgall in a pint; 500 c.c., of water would be much more likely to be successful.]

PEPSINUM.

PEPSIN.—[A proteolytic ferment or enzyme obtained from the glandular layer of fresh stomachs from healthy pigs, and capable of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumin.

SOURCE.—The mucous membrane of a pig's stomach, dissected off and finely chopped, is macerated in water acidulated with Hydrochloric Acid for several days, with frequent stirring. The strained liquor is decanted and Sodium Chloride mixed with it. After several hours the floating mixture is skimmed from the surface and placed in cotton cloth to drain, and finally submitted to strong pressure to get rid of the saline solution.

CHARACTERS.—A fine, white, or yellowish-white, amorphous powder, or thin, pale yellow or yellowish, transparent or translucent grains or scales, free from any offensive odor, and having a mildly acidulous or slightly saline taste, usually followed by a suggestion of bitterness. It slowly attracts moisture when exposed to the air. *Solubility.*—Soluble, or for the most part soluble, in about 100 parts of water, with more or less opalescence; more soluble in water acidulated with Hydrochloric Acid; insoluble in Alcohol, Ether or Chloroform.

Dose, 5 to 60 gr.; .30 to 4.00 gm.

Preparation.

Pepsinum Saccharatum.—Saccharated Pepsin. Pepsin, 10; Sugar of Milk, 90. By trituration. Saccharated Pepsin should digest 300 times its own weight of freshly coagulated and disintegrated egg albumin.

Dose, 5 to 60 gr.; .30 to 4.00 gm]

ACTION AND THERAPEUTICS.

Pepsin may be given to help gastric digestion in those in whom from old age or long illness the secretion of gastric juice is deficient. Thus, for example, it is useful in convalescence from acute illness or in cases of cancer of the stomach. It is of no use as an aid to the digestion of fatty or carbo-hydrate food. It should be given in a powder or a pill directly after meals, and should be followed in about half an hour by a dose of hydrochloric acid. The pepsin should be tested before use, as many preparations in the market are inert powders.

Pepsin may be used to predigest albuminous food, either for administration by the mouth or the rectum. Often this is better than giving pepsin internally, for morbid processes may be going on in the stomach which prevent digestion. The rectum has very feeble powers of digestion, and therefore nutrient enemata or suppositories should always be predigested. It is found that for predigestion pancreatin (*see* p. 595), is usually a more reliable preparation than pepsin. Both should be employed with judgment, for there is a likelihood that if artificial digestion be used too long, the digestive functions may [become incapable of action] from want of use.

The following directions for peptonizing meat may be followed. Take one pound [450. gm.] of lean meat, reduce to a fine pulp,

six times its weight of water containing 0.2 per cent. of hydrochloric acid and 120 gr. [8. gm.] of pepsin. Digest at 120° F. [48.8° C.] in a porcelain digester for five or six hours with frequent stirring. Then neutralize with sodium carbonate, boil and filter. Evaporate the filtrate on a water bath till it is of the consistency of a soft extract.

Peptonized meat suppositories are often very valuable. To make one suppository 30 gr. [2. gm.] of the above extract is mixed with 40 gr. [2.40 gm.] of oil of theobroma, and moulded in a conical mould.

[PANCREATINUM.

PANCREATIN. *Synonym.*—Zymine, B. P. A mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (*Sus scrofa* Linné; class *Mammalia;* order *Pachydermata*). *Habitat.*—Domesticated.

SOURCE.—Macerate the cut-up pancreas in water acidulated with Hydrochloric Acid for forty-eight hours, add a saturated solution of Sodium Chloride, allow to stand until the Pancreatin rises to the surface; skim this, drain in a muslin filter, wash with a less concentrated solution of salt until nearly dry; then rub up with Sugar of Milk, dry thoroughly without heat, and dilute with Sugar of Milk, until 10 gr.; .60 gm., will just emulsify 2 dr.; 8. gm. of Cod Liver Oil.

CHARACTERS.—A yellowish, yellowish-white, or grayish, amorphous powder, odorless, or having a faint, peculiar, not unpleasant odor, and a somewhat meat-like taste. *Solubility.*—Slowly and almost completely soluble in water, insoluble in Alcohol.

Dose, 5 to 15 gr.; .30 to 1.00 gm.

ACTION AND USES.

Pancreatin digests albuminoids, converts starch into sugar; emulsifies fats and curdles milk, if an alkali be not present, on boiling. It is used as an artificial agent to assist the digestion of invalids and of old persons, or those prostrated by fever or exhaustion. Also by means of this, food may be partially or wholly digested previous to administration. It should be used in combination with an alkali, as sodium bicarbonate, in the proportion of 1 to 4. Nutritive enemata should be thoroughly pancreatized.]

ADEPS.

LARD.—The prepared [internal fat of the abdomen of *Sus Scrofa* Linné (class *Mammalia;* order *Pachydermata*), purified by washing with water, melting, and straining. *Habitat.*—Domesticated.

CHARACTERS.—A soft, white, unctuous solid, having a faint odor free from rancidity, and a bland taste. *Solubility.*—Insoluble in water; very slightly soluble in Alcohol; readily soluble in Ether, Chloroform, Carbon Disulphide or Benzin. Sp. gr., about 0.932 at 59° F.; 15° C.]

Preparations.

1. **Adeps Benzo[inatus.**—*See* Benzoin, p. 567.
2. **Ceratum.**—Cerate. White wax, 300; lard, 700.
3. **Ceratum Resinæ.**—*See* Resin, p. 454.
4. **Unguentum.**—Ointment. Lard, 800; yellow wax, 200.]

[**OLEUM ADIPIS.**—Lard Oil. A fixed oil expressed from Lard at a low temperature.

CHARACTERS.—A colorless, or pale yellow oily liquid, having a peculiar odor, and a bland taste. Sp. gr., 0.910 to 0.920.

COMPOSITION.—(1) *Olein.* (2) *Palmitin.* (3) *Stearin.*]

ACTION AND THERAPEUTICS.

Lard is an emollient, and is used as a basis for ointments. The benzo[in]ated lard has the advantage of not quickly becoming rancid.

CETACEUM.

SPERMACETI.—[A peculiar, concrete, fatty substance, obtained from *Physeter macrocephalus* Linné (class *Mammalia;* ordor *Cetacea*). *Habitat.*—Pacific and Indian Oceans.

CHARACTERS.—White, somewhat translucent, slightly unctuous masses of a scaly-crystalline fracture and a pearly lustre; odorless, and having a bland, mild taste. It becomes yellowish and rancid by exposure to air. Sp. gr., about 0.945. *Solubility.*—Insoluble in water, and nearly so in cold Alcohol; also in Ether, Chloroform, Carbon Disulphide, fixed and volatile oils; only slightly soluble in cold Benzin.

COMPOSITION.—It is mainly *Cetylic Alcohol*, $C_{16}H_{33}OH$, which in combination with *Palmitic Acid*, $HC_{16}H_{31}O_2$, forms a fat, *Cetin*, $C_{16}H_{33}C_{16}H_{31}O_2$.]

Preparations.

[1. **Ceratum Cetacei.**—Spermaceti Cerate. Spermaceti, 100; White Wax, 350; Olive Oil, 550.

2. **Unguentum Aquæ Rosæ.**—*See* Rose, p. 573.]

ACTION AND THERAPEUTICS.

Spermaceti is used as an emollient and as a basis for ointments and [cerates].

VITELLUS.

YOLK OF EGG.—The yolk of the egg of *Gallus Bankiva*, var. *domestica* [Temminck (class *Aves;* order *Gallinæ*). *Habitat.*—Java and Cochin China: domesticated.

COMPOSITION.—(1) Vitellin, 16 per cent. (2) Fat, 30 per cent. (3) Inorganic Salts, Cholesterin, Lecithin, and coloring matter.

Preparation.

Glyceritum Vitelli.—*See* Glycerin, p. 528.

ACTION AND THERAPEUTICS.

Yolk of egg is emollient and] nutritive.

OLEUM MORRHUÆ.

COD LIVER OIL. *Synonym.*—[Oleum Jecoris Aselli. A fixed oil obtained from fresh livers of *Gadus Morrhua* Linné, and of other species of *Gadus* (class *Pisces;* order *Teleostia;* family *Gadida*). *Habitat.*—North Atlantic Ocean.

SOURCE.—The fresh livers are slowly heated, and the oil is decanted from the water, and sometimes deprived of the solid fat by partial freezing.

CHARACTERS.—A pale yellow, thin, oily liquid, having a peculiar, slightly fishy, but not rancid odor, and a bland, slightly fishy taste. Sp. gr., 0.920 to 0.925. *Solubility.*—Scarcely soluble in Alcohol, but readily soluble in Ether, Chloroform, or Carbon Disulphide; also in 2.5 parts of Acetic Ether.

COMPOSITION.—The chief constituents are—(1) *Olein*, 70 per cent., which is a fluid fixed oil, and is Glycerin Oleate, the most abundant constituent of Cod Liver Oil. (2) *Palmitin*, with some Stearin, 25 per cent. (3) Free fatty acids, as Oleic, Palmitic, Stearic. (4) *Gaduin*, $C_{35}H_{66}O_9$, a peculiar principle, very insoluble in ordinary menstrua. (5) *Morrhuol*, a crystalline substance containing Phosphorus, Iodine and Bromine. (6) Traces of Iodine and Bromine. (7) Biliary principles. The so-called alkaloids of Cod Liver Oil are decomposition products, ptomaines or cadaveric alkaloids, and are found in larger quantities in the brown oils. Their existence in fresh oil obtained from healthy livers has not been demonstrated.]

Dose, 1 to 4 fl. dr.; [4. to 15. c.c.]

ACTION.

External.—Cod liver oil is a bland unirritating oil. If it is desired to administer it in cases in which it is rejected by the

stomach, it may be rubbed into the skin. The oil is certainly absorbed when applied in this way.

Internal—*Gastro-intestinal tract.*—Cod liver oil, even more than other oils, is liable to cause indigestion, nausea, and sickness. Large doses may set up diarrhœa. It is **more readily absorbed** than other oils. Loops of intestine have been isolated in the lower animals, and into each loop different oils have been injected. The intestines are returned to the abdominal cavity, and after some time the animal is killed and the loops are opened. It is always found that the cod liver oil has been more rapidly absorbed than any other oil. The facility with which cod liver oil is absorbed is also shown by the fact that it often cannot be recognized in the fæces, although equal quantities of other oils taken by the mouth are passed unaltered. Some authorities believe that the superior absorbability of cod liver oil depends on the biliary principles contained in it, but this is doubtful; others think that it is because the presence of free acids facilitates saponification and emulsion.

Tissues.—Not only is cod liver oil more readily absorbed than other oils, but it is a better **food.** All oils lead to an increased formation of fat, but cod liver oil is the most powerful in this respect. It reduces the color of a solution of [potassium] permanganate more readily than other oils—that is to say, it is more readily oxidized. Thus, as it is more easily absorbed and more easily oxidized, we have a partial explanation of its peculiar value in increasing the weight of the body; but the general belief is that these two facts do not wholly explain the action of cod liver oil, and that it has some peculiar specific action not yet understood, especially upon those suffering from phthisis, for whom it is a very valuable drug.

Therapeutics.

External.—The smell of cod liver oil is so disagreeable that it should not be rubbed in externally unless this treatment be absolutely necessary.

Internal.—Cod liver oil is of the greatest service in all

varieties of tuberculous disease, the contra-indications being high temperature, severe hæmoptysis and dyspepsia, vomiting, or diarrhœa, whether primary or induced by the oil. Patients commonly improve in every way under its influence With the same exceptions it may be administered with great advantage in rickets, and in any chronic disease associated with loss of flesh, such as suppuration, convalescence from acute disease, tertiary syphilis and starvation. It often is of benefit in the chronic bronchitis and the chronic eczema of childhood. It is frequently given with success in neuralgia, general feebleness, despondency and other nervous conditions. Formerly it was often prescribed for chronic rheumatism. Many persons cannot, or imagine they cannot, take it on account of its [unpleasant] taste. There are in the market several preparations of cod liver oil in which, by careful preparation, the disagreeable taste is almost abolished. Ten minims [.60 c.c.] of pure ether, with a drop or two of oil of peppermint or cloves, will, when mixed with a dose of cod liver oil, often render it more palatable. Sometimes it is taken in [soft] capsules, or made into a jelly with isinglass, or a little salt is put into the mouth after the oil is taken, or the mouth is rinsed out with brandy beforehand. Sometimes it is taken in coffee, but perhaps the best way is to form an emulsion of it. A very nutritious one is made by rubbing together equal parts of extract of malt and cod liver oil.

The British Pharmaceutical Conference advises the following emulsion:—Cod liver oil, 8 fl. oz. [240. c.c.]; the yolk of two eggs; tragacanth in powder, 16 gr. [1. gm.]; elixir of [saccharin (saccharin,] 24 gr.; [1.50 gm.]; Sodium Bicarbonate, 12 gr. [.75 gm.]; alcohol, 1 fl. dr.; [4. c.c.]; distilled water, 7 fl. dr. [28. c.c.]), 1 fl. dr. [4. c.c.]; tincture of benzoin, 1 fl. dr.; [4. c.c.]; spirit of chloroform, 4 fl. dr.; [15. c.c.]; oil of bitter almond, 8 m.; [.50 c.c.]; distilled water to 16 fl. oz.; [500. c.c.]. Dose, 2 to 8 fl. dr.; [8. to 30. c.c.]. It is frequently desirable to give cod liver oil with iron. In that case the following preparation, in which the oil is emulsified with an alkali, will be found useful:—Cod liver oil, 4 fl. dr.; [15. c.c.]; iron and ammonium [citrate],

5 gr.; [.30 gm.]; potassium carbonate, 3 gr.; [.20 gm.]; [saccharin,] ¼ gr. [.015 gm.]; oil of caraway, 1 m.; [.06 c.c.]; water to 1 fl. oz.; [30. c.c.].

MEL.

HONEY.—A saccharine secretion deposited in the honey-comb by *Apis mellifica* Linné [(class *Insecta;* order *Hymenoptera*). *Habitat.*—Domesticated.

CHARACTERS.—A syrupy liquid of a light yellowish to pale yellowish-brown color, translucent when fresh, but gradually becoming opaque and crystalline, having a characteristic, aromatic odor, and a sweet, faintly acrid taste.

COMPOSITION.—The chief constituents are—(1) *Dextrose* or Grape Sugar. (2) *Glucose* or Fruit Sugar. (3) Wax. (4) Volatile oil. (5) Formic Acid, a minute quantity.]

Preparation.

Mel Despumatum.—Clarified honey. Melt honey in a water-bath, and strain while hot, adding 5 per cent. of Glycerin.

Clarified honey is contained in Confectio Rosæ and Mel Rosæ.

[**Dose, freely.**]

ACTION AND THERAPEUTICS.

Honey is demulcent, relieving dryness of the mouth and facilitating swallowing. Oxymel, [clarified honey 8, acetic acid 1, water 1,] is a useful preparation. It is a common ingredient of cough mixtures. Honey is a mild laxative, and may be given to children for this purpose.

CERA.

[**CERA FLAVA.**—Yellow Wax. A peculiar, concrete substance, prepared by *Apis mellifica* Linné (class *Insecta;* order *Hymenoptera*).

CHARACTERS.—A yellowish to brownish-yellow solid, having an agreeable, honey-like odor, and faint, balsamic taste. Sp. gr., 0.955 to 0.967. *Solubility.*—Insoluble in water, sparingly soluble in cold Alcohol. It is completely soluble in Ether, Chloroform, and in fixed and volatile oils.

COMPOSITION.—The principal constituents are—(1) Hydrocarbons (probably $C_{27}H_{56}$ and $C_{34}H_{64}$) about 12 per cent. (2) *Cerin* or Cerotic Acid, $C_{27}H_{54}O_2$. (3) *Myricin* or Myrical Palmitate, $C_{30}H_{61}.C_{16}H_{31}O_2$, the principal constituent. (4) An Alcohol, $C_{25}H_{52}O$, in small quantities. (5) *Ceryl Alcohol*, $C_{27}H_{56}O$.

Yellow Wax is used in Ceratum Cantharidis, Ceratum Resinæ, Unguentum, and Unguentum Picis Liquidæ.]

[**CERA ALBA.**—White Wax. Made by bleaching yellow wax by exposure to moisture, air and light.

CHARACTERS.—A yellowish-white solid, somewhat translucent in thin layers, having a slightly rancid odor, and an insipid taste. Sp. gr., 0.965 to 0.975.

COMPOSITION.—As of yellow wax.

White Wax is used in Ceratum, Ceratum Camphoræ, Ceratum Cetacei and Unguentum Aquæ Rosæ.]

USES.

Yellow and white wax are only used as bases for many plasters, [cerates] and ointments.

COCCUS.

COCHINEAL. *Synonyms.*—Cochineal Bug. Red Scale Insect. The dried female [of *Coccus cacti* Linné (class *Insecta;* order *Hemiptera*). *Habitat.*—Mexico and Central America; upon *Opuntia cochinillifera*, Miller, and other species.

CHARACTERS.—About 5 mm. long, of a purplish-gray or purplish-black color; somewhat oblong and angular in outline; flat or concave beneath; convex above; transversely wrinkled; easily pulverizable, yielding a dark red powder; odor faint; taste slightly bitterish.]

COMPOSITION.—The chief constituents are—(1) *Carminic Acid*, [$C_{17}H_{18}O_{10}$, 10 per cent. (2) *Coccerin*, a wax. (3) Fat, consisting of myristin, liquid fat, and fatty acids]

Cochineal is contained in Tinctura Cardamomi Composita.

USES.

Cochineal is only used as a coloring agent.

CANTHARIS.

CANTHARIDES. [*Synonyms.*—Spanish Flies. Blister Beetles. The *Cantharis vesicatoria* De Geer (class *Insecta;* order *Coleoptera*). *Habitat.*—Southern and Central Europe, mainly on Oleaceæ and Caprifoliaceæ.

CHARACTERS.—About 25 mm. long and 6 mm. broad; flattish-cylindrical, with filiform antennæ, black in the upper part, and with long wing-cases and ample, membranous, transparent, brownish wings; elsewhere of a shining, coppery-green color. The powder is grayish-brown, and contains green, shining particles. Odor strong and disagreeable; taste slight, afterwards acrid.]

2. Collodium Cantharida

3. Tinctura Cantharidis.
ides, 50; by percolation with *A*
Dose, 1 to 15 m.; .06 to 1

4, Emplastrum Picis Ca
p. 454.]

ACTI

External.—Cantharides is a
is slower in its action than most [ir
tions are applied to the skin, no ef
hours; then a tingling, burning pa
becomes red from vascular dilatatio
rubefacient effect. The next stag
vesicles. These soon run together
clear serum. Not only is cantharid
but it is a powerful **counter-irritar**
action the vessels of the deep-seate
application.

Cantharidin can be absorbed by
to produce internal effects.

Internal.—Cantharides is har
cine, as it is such a powerful

have set in the patient complains of great **pain in the loins** and strangury—that is to say, there is an urgent desire to micturite; the effort is very painful from vesical tenesmus, and the quantity of urine passed is very small; it may contain **albumin and blood.** In severe cases of poisoning there may be greatly increased sexual desire, numerous seminal emissions, violent priapism, with swelling and heat of the genital organs. In women cantharides may cause abortion or induce menstruation. *Post-mortem.*—Intense **gastro-intestinal inflammation** is present, conseqently swelling, ecchymoses, and hyperæmia of the mucous membrane of the alimentary canal are observed. The **kidneys are found to be very congested,** and in the early stage of acute nephritis, there is also much inflammation of the genito-urinary mucous membrane.

THERAPEUTICS.

External.—Cantharides is very largely employed to raise a blister, and it is of all drugs the most commonly used counter-irritant. It is applied to the chest in pleurisy, over the pericardium in pericarditis, over the inflamed nerves in neuritis, over the mastoid process in disease of the ear, over joints with chronic effusion into them, over the stomach when there is gastric pain, vomiting, etc. A blister applied over the nerve will often relieve pain in neuralgia. If a further counter-irritant effect is desired, the blister, which is usually pricked, may be irritated by the application of any irritating ointment: Unguentum Sabinæ [B. P., fresh savine tops, 8; yellow wax, 3; benzoinated lard, 16] was formerly much used for this purpose. If the irritation produced by the cantharides itself is sufficient, a dressing of some simple ointment should be applied when vesication is complete. The cantharides preparation should not be left on after the development of the bleb, lest the cantharidin should be absorbed. Cantharides should not be applied to a part on which the patient lies, or a bed-sore may form; nor must it be used in renal disease; and it should be carefully employed in children or debilitated persons. It ought not to be applied to paralyzed limbs.

Internal.—The drug is rarely given internally, but it has been used with success in small doses in cases of chronic gleet. Sometimes, but not often, it relieves chordee. [Cantharidin, in the form of potassium cantharidinate, has been used as a remedy for pulmonary tuberculosis, and for lupus. For all that cures of both of these diseases have been claimed, the value of this drug is by no means established.

TOXICOLOGY.

For the symptoms, *see* p. 602. There is no chemical nor physiological antidote to Cantharides. The stomach should be emptied by emetics (*see* p. 128.) or washed out by the stomach-pump. Mucilaginous and demulcent liquids should be freely given. Opium is indicated to relieve the pain and gastro-enteritis.]

APPENDIX, No. I.

NON-PHARMACOPŒIAL REMEDIES.

[The following remedies are official in the British Pharmacopœia.]

ACIDUM MECONICUM.

MECONIC ACID.—$H_3C_7HO_7 = [199.51.]$

SOURCE.—The Calcium Meconate, which is precipitated in the manufacture of Morphine Hydrochlorate, is placed in hot water and treated with Hydrochloric Acid. On cooling, Meconic Acid crystallizes out.

CHARACTERS.—Almost colorless, micaceous crystals. *Solubility.*—1 in 150 of water, 1 in 45 of [Alcohol]; it is decomposed by boiling water.

Preparation, [*B. P.*]

Liquor Morphinæ Bimeconatis.—[Solution of Morphine Bimeconate.] Morphine is precipitated by Ammonia from a solution of the hydrochlorate. It is dissolved in water, Alcohol and Meconic Acid. Strength 1 in 80.

Dose, 5 to 40 m.; [.30 to 2.50 c.c.]

[ACTION.

Meconic Acid appears to be nearly free from active physiological properties; nearly 20 gr.; 1.20 gm., have been administered to dogs with negative results.]

ACONITINA.

ACONITINE.—$C_{33}H_{42}NO_{12}, ? = [645.54. ?]$

SOURCE.—It is precipitated from an aqueous solution of an alcoholic extract of the powdered root by Ammonia, and then purified.

CHARACTERS.—A white, amorphous or crystalline alkaloid. Causes tingling and numbness of the skin. An intense poison. *Solubility.*—1 in 2600 of cold water, 1 in 40 of Alcohol or Ether, 1 in 1 of Chloroform. Must be given internally with great caution. It is very difficult to obtain pure, and commercial preparations vary very much. Potash splits it up into Benzoic Acid and Aconine. Non-official species of Aconitum yield different kinds of Aconitine.

[Dose, $\frac{1}{100}$ gr.; .0003 gm., with caution.]

with great benefit, in neuralgia,
small piece is rubbed in until num
it fails, and we cannot tell beforel

ADEPS L

WOOL FAT.—The purified chol
in the dressing of sheep's wool.

SOURCE.—Sheep's wool, washed with
and pressure, yields impure wool fat. T
with alkali, and then washed with an acid

CHARACTERS.—Semi-transparent, pal
it burns with a sooty flame. Melts betwe
44.4° C.]; odor like sheep's wool. *Solub*
Ether, partially in Alcohol. Insoluble in w
up 1¼ times its weight.

[*Wool Fat is used to prepare* Adeps La

ALBUME

OVI ALBUMEN.—[Egg Albumen
of *Gallus bankiva var, domestica* (nat. ord.
cated].

ACTION AND THE

Albumen is an antidote to poiso
tants, especially [corrosive mercuri-
lead

[USES.

Fusel oil is a poison, and is not used in medicine. The manufacturers of cinchona alkaloids employ it as a solvent; formerly it was required for the preparation of valerianic acid.]

ANETHUM.

DILL.—The dried fruit of *Peucedanum graveolens* (nat. ord. *Umbelliferæ*). *Habitat.*—Middle and Southern Europe.

CHARACTERS.—Broadly oval, [12 mm.] long, brown, flat, with a pale, broad, membranous border. Mericarps distinct, odor and taste agreeable and aromatic. *Resembling Dill.*—Conium, Anise, Fennel, Caraway; but Dill is winged.

COMPOSITION.—The chief constituent is the official *volatile oil* (*see* below).

Preparation, [*B. P.*]

Aqua Anethi.—[Dill Water.] Dill Fruit, 1; water, 10.
Dose, 1 to 2 fl. oz. [30. to 60. c.c.]

OLEUM ANETHI.—[Oil of Dill.] The oil distilled in Britain from the Dill fruit.

CHARACTERS.—Pale yellow, odor pungent, taste hot and sweetish.

COMPOSITION.—The chief constituents are—(1) *Anethene*, a terpene. (2) The oxidized substance identical with Car[v]ol, (*see* p. 482.)

Dose, 1 to 4 m.; [.06 to .25 c.c.]

ACTION AND THERAPEUTICS.

The same as those of anise and caraway. Dill water is a common carminative for children, and it covers very well the taste of sodium salts.

ANTIPYRINUM.

ANTIPYRIN.—Phenazonum, [B. P.] *Synonym.*—Phenyl-dimethyl-pyrazolone. $C_6H_5(CH_3)_2C_3HN_2O.$ = [187.65.]

SOURCE.—Aceto-acetic Ether is acted upon by Phenyl-hydrazine, when Phenyl-monomethyl-pyrazolone, Ethyl Alcohol, and water are formed. $CH_3COCH_2COOC_2H_5 + H_2NNHC_6H_5 = C_6H_5(CH_3)C_3H_2N_2O + C_2H_5OH + H_2O.$ The Monomethyl compound is treated with Methyl Iodide and Methyl Alcohol. $C_6H_5(CH_3)C_3H_2N_2O + CH_3I = C_6H_5(CH_3)_2C_3HN_2O + HI.$

CHARACTERS.—Colorless, odorless, scaly crystals [of a somewhat bitter taste], freely soluble in water, Alcohol and Chloroform.

INCOMPATIBLES.—Iron sulphate, iodide, and chloride; copper sulphate;

iodine; arsenic iodide; carbolic, hydrocyanic, and nitric acids; potassium permanganate; salicylates; [corrosive mercuric chloride]; Spirit of Nitrous Ether; all preparations of Tannin give a white precipitate; Chloral decomposes it.

Dose, 3 to 20 gr.; [.20 to 1.20 gm.]

ACTION AND THERAPEUTICS.

[Antipyrin in small doses may moderately increase arterial pressure by direct stimulation of the heart (Wood); in large doses it is a cardiac depressant, the final fall of blood pressure being certainly due, at least in part, to a direct action upon the heart. It also contracts the blood-vessels, being therefore a local hæmostatic. It is a mild diuretic, and is quickly excreted in the urine as antipyrin. It may produce an erythematous rash. It rapidly reduces an elevated temperature by decreasing heat production, by direct action on the centre which presides over heat production, and to a much less extent increases heat dissipation. In large doses it is said to produce convulsions, later coma, and paralysis of motor nerves and muscles.

Antipyrin is given internally as a **powerful antipyretic,** in fevers of various kinds. It is also used as a hæmostatic in hæmorrhoids and epistaxis. It has been used with some success in diabetes. It is largely employed as an **anti-neuralgic,** relieving the pains of locomotor ataxia and other nervous affections, and as an **anti-rheumatic.** It has been highly recommended in chorea and epilepsy. Externally it is supposed to be an antiseptic, but irritation has followed its hypodermatic use. It is a local anæsthetic.

Salipyrin is prepared by the action of antipyrin upon salicylic acid in substance. It is a white, coarsely-crystalline powder with a rather sweetish taste, readily soluble in alcohol, but slightly in water. In chronic articular rheumatism and rheumatic sciatica it has been successful, but it does not prevent relapses. It has been successfully used for spasmodic dysmenorrhœa. The dose is from 6 to 30 gr.; .40 to 2 00 gm.

Iodopyrin, or *iodantipyrin,* is supposed to have a hydrogen atom in the phenyl group of antipyrin replaced by iodine. It

occurs in colorless, prismatic needles, which are tasteless. It is, with difficulty, soluble in cold water or alcohol, but readily when hot. It causes a fall of temperature and perspiration, but without collapse or shivering. It is doubtful if it has any advantage over antipyrin. The dose is from 2 to 15 gr.; .12 to 1.00 gm.

Hypnal is a compound of chloral with antipyrin, made by mixing their solutions, and is obtained in crystalline form. It was proposed by Bardet as a hypnotic, more certain than chloral, nearly free from taste, entirely free from irritating effect upon the mucous membranes, and having distinct analgesic effects. The dose is about 15 gr.; 1.00 gm.]

TOXICOLOGY.

Antipyrin occasionally produces, in man, collapse, cyanosis, very slow respiration, a feeble and irregular pulse, vomiting and profound prostration. It is not known whether these symptoms have been due to impurities in the drug, [but it is quite likely that they have arisen from improper dosage]. Many deaths have been caused by this drug; it has been stated that during one epidemic of influenza in Vienna seventeen persons were killed by it.

Treatment.—Stimulation by Alcohol and Ether subcutaneously and by the mouth; Strychnine subcutaneously to stimulate the heart; warmth to the feet and body.

ARMORACIA.

HORSE-RADISH.—The fresh root of the *Cochlearia Armoracia* (nat. ord. *Cruciferæ*). *Habitat.*—Cultivated in [the United States] and Britain. It is most active in the autumn and early spring, before the leaves have appeared.

CHARACTERS.—A long, cylindrical, fleshy root, enlarged at the upper end, where it is marked by the scars of fallen leaves, [12 to 25 mm.] in diameter, and usually [30 cm] or more long. Pale yellowish or brownish-white externally; whitish and fleshy within. Taste very pungent. Inodorous unless bruised or scraped. *Resembling horse-radish root.*—Aconite root, which is shorter, conical, not cylindrical, darker, and causes tingling and numbness when chewed.

COMPOSITION.—The chief constituent is a substance which, by the action of a ferment, yields a volatile oil identical with that of Mustard.

Preparation, [*B. P.*]

Spiritus Armoraciæ Compositus.—[Compound Spirit of Horse-Radish.] Scraped Horseradish Root, 10; bitter Orange Peel, 10; Nutmeg, 1; Alcohol, 192; water, 72.

Dose, 1 to 2 fl. dr.; [4. to 8. c.c.]

Action and Uses.

Horse-radish is a condiment, having the same action as mustard. It has been used as a counter-irritant. The spirit is a pleasant flavoring and carminative agent.

BELÆ FRUCTUS.

BAEL FRUIT.—The dried half-ripe fruit of *Ægle marmelos* (nat. ord. *Rutaceæ*). *Habitat.*—Malabar and Coromandel.

CHARACTERS.—Roundish fruit the size of a large orange, usually imported in fragments of the hard, woody rind, with adherent dried pulp and seeds.

COMPOSITION.—Not known.

Preparation, [*B. P.*]

Extractum Belæ Liquidum.—[Liquid Extract of Bael Fruit.]

Bael Fruit, 16; water, 17.

Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

Action and Therapeutics.

The imported bael fruit is useless. In India the extract of the fresh fruit is used for the treatment of diarrhœa and dysentery; but its mode of action is unknown. It contains no tannin.

BUTYL-CHLORAL HYDRAS.

BUTYL-CHLORAL HYDRATE.—$C_4H_5Cl_3O.H_2O$ = [192.91].

Synonym.—Croton Chloral Hydrate. (This is a misnomer.)

SOURCE.—Dry Chlorine Gas is passed through Aldehyde. Butyl-chloral ($C_4H_5Cl_3O$) is formed. It is separated by fractional distillation, and water is added.

CHARACTERS.—Pearly-white, crystalline scales, with a nauseous taste and a pungent odor like chloral. *Solubility.*—1 to 50 of water, freely in Alcohol and Glycerin.

INCOMPATIBLES.—All alkalies.

Dose, 5 to [20 gr.; .30 to 1.20 gm.]

Action and Therapeutics.

The action of this drug is exactly similar to that of chloral, but butyl-chloral hydrate is less certain in its effects. It is said to be less depressant to the heart, but this is doubtful. It has a specific action in relieving neuralgia of the fifth nerve.

CANELLA.

CANELLÆ CORTEX.—[Canella Bark.] The bark of *Canella alba* (nat. ord. *Canellaceæ*) deprived of its corky layer and dried. *Habitat.*—South Florida and the Bahamas.

CHARACTERS.—Quills [8 to 20 cm.] long, or flattish pieces. Externally, orange-brown or buff, with sometimes remains of corky layer as silver-gray patches; whitish internally. Agreeable odor, like Cloves and Cinnamon; bitter taste.

COMPOSITION.—The chief constituents are—(1) A volatile oil (1 per cent.), consisting of several oils, one of which is identical with Eugenic Acid, from Oil of Cloves. (2) A bitter principle, *Canellin*. No Tannin is present.

Dose, 15 to 60 gr.; [1. to 4. gm.]

ACTION AND USES.

Canella bark is an aromatic bitter stomachic, not often prescribed.

CEREVISIÆ FERMENTUM.

YEAST. [*Synonym.*—] Beer yeast. The ferment obtained in brewing beer, and produced by *Saccharomyces* (*Torula*) *cerevisiæ* (nat. ord. *Fungi*).

CHARACTERS.—Viscid semi-fluid, frothy, exhibiting under the microscope numerous roundish or oval cells, or filaments composed of cells. Odor peculiar. Taste bitter.

Dose, ½ to 2 fl. oz.; [15. to 60. c.c.]

ACTION AND THERAPEUTICS.

A yeast poultice (yeast 3, water at 100° F.; [37.7° C.] 3, flour 7) has been applied to sloughing sores and ulcers, but it is rarely used.

CUSPARIA.

CUSPARIÆ CORTEX.—Cusparia Bark. *Synonym.*—Angustura Bark. The bark of *Galipea cusparia* (nat. ord. *Rutaceæ*). [*Habitat.*—] Tropical South America.

CHARACTERS.—Flat or curved pieces or quills, [16 cm.] or less long, [4 mm.] thick, obliquely cut on inner edge. Externally a yellowish-gray, mottled, corky layer, which can be scraped off, and shows a dark brown resious layer; inner surface light brown, flaky. Fracture short, resinous, and showing under a lens, white points or lines. Taste bitter, aromatic. Odor musty, disagreeable. *Resembling Cusparia.*—Canella Alba, but this is darker, and has pared edges.

IMPURITY.—Bark of *Strychnos nux-vomica* (false Angustura bark); its inner surface gives bright blood-red color with Nitric Acid, showing Brucine; Cusparia does not.

COMPOSITION.—The chief constituents are—(1) *Cusparine*, or Angusturine, a crystalline bitter alkaloid. (2) An alkaloid, *Galipeine*. (3) An aromatic oil. It is stated that no Tannin is present, but Iron Salts are incompatible with Cusparia.

INCOMPATIBLES.—Mineral acids and metallic salts.

Dose, 10 to 40 gr.; [.60 to 2.40 gm.]

Preparation, [*B. P.*]

Infusum Cuspariæ.—[Infusion of Cusparia]. 1 in 20 of water at 120° F.; [48.8° C.] (to avoid extraction of nauseous principles).

Dose, 1 to 2 fl. oz.; [30. to 60. c.c.]

ACTION AND THERAPEUTICS.

Cusparia bark is an aromatic bitter, having a similar action to calumba. It is used to make Angustura Bitters. In South America it is given as an antiperiodic.

ELEMI.

MANILLA ELEMI.—A concrete resinous exudation, probably from *Canarium commune* (nat. ord. *Burseraceæ*). *Habitat.*—Manilla.

CHARACTERS.—A soft unctuous mass, becoming harder and yellowish by age. Strong fennel-like odor. *Resembling Elemi.*—Asafœtida, Galbanum, and Ammoniacum, but Elemi is known by its smell.

COMPOSITION.—The chief constituents are—(1) Resinous bodies, 80 per cent. (2) A terpene.

Preparations, [*B. P.*]

Unguenti Elemi.—[Elemi Ointment.] Elemi, 1; ointment, 4.

ACTION AND THERAPEUTICS.

Elemi acts like oleoresins generally, but is only used as a stimulant and disinfectant ointment.

EUCALYPTI GUMMI.

EUCALYPTUS GUM. *Synonym.*—Red Gum. A ruby-colored exudation from the bark of *Eucalyptus rostrata* (nat. ord. *Myrtaceæ*) and from other species. [*Habitat.*—] Australia.

CHARACTERS.—An inspissated secretion forming semi-translucent and garnet-colored granules. Tough and difficult to powder. Adheres to the

teeth when chewed. Soluble in water. *Resembling Eucalyptus Gum.*—Kino, which is darker and feebly soluble in water.

COMPOSITION.—The chief constituents are—(1) *Kino-tannic Acid.* (2) *Catechin.* (3) *Pyrocatechin.*

Dose, 2 to 10 gr.; [.12 to .60 gm.] in a powder, or in an aqueous solution or made into a pill with mucilage of Acacia.

ACTION AND THERAPEUTICS.

Red gum is, in virtue of its tannic acid, powerfully **astringent** and is used in diarrhœa and dysentery. Lozenges, 1 gr. [.06 gm.] in each, with fruit paste, or a decoction of 1 in 40, as a gargle, are employed for relaxed throats. This decoction may also be given in 2 to 4 [fl.] dr. [8. to 15. c.c.] doses for diarrhœa. A fluid extract (red gum, 7; water, 21; alcohol, 1;) dose, ½ to 1 fl. dr. [2. to 4. c.c.]) is a useful preparation. Injected into the nose it stops epistaxis. Mixed with 1 to 10 of water it may be injected into the rectum or vagina, or may be used as a mouth wash. Suppositories, each containing 5 gr.; [.30 gm.] of red gum, are prepared, and may be employed for piles.

FARINA TRITICI.

WHEATEN FLOUR.—The grain of wheat, *Triticum sativum* (nat. ord., *Graminaceæ*), ground and sifted. [*Habitat.*—Cultivated.]

COMPOSITION.—The chief constituents are—(1) *Starch.* (2) *Gluten.* (3) Sugar. (4) Mucilage. (5) Salts.

[USES.]

Flour is used in the form of Mica Panis (bread crumb) as a basis for pills, and in the making of cataplasmata.

FERRI ARSENAS.

IRON ARSENATE.—It consists of both ferrous and ferric arsenates, with some oxides. [$3Fe(FeO)AsO_4+16H_2O=1086.74$.]

SOURCE.—Mix hot solutions of Sodium Arsenate and Iron Sulphate, add Sodium Bicarbonate to neutralize the free Sulphuric Acid that is formed. Iron Arsenate is precipitated.

CHARACTERS.—A greenish, amorphous powder, insoluble in water.

IMPURITIES.—Sulphates.

Dose, $\frac{1}{10}$ to ½ gr.; [.004 to .03 gm.] as a pill.

[USES.

Iron arsenate is used when a combination of these metals is required].

GALBANUM.

GALBANUM.—A green resin obtained from *Ferula galbaniflua*, *Ferula rubricaulis* (nat. ord. *Umbelliferæ*), and probably other species. [*Habitat.*]—India and the Levant.

CHARACTERS.—Tears or masses of agglutinated tears. Tears roundish, about the size of a pea, yellowish-brown or yellowish-green. Translucent, rough, and dirty. Hard and brittle in the cold, softening with heat and becoming sticky. Masses contain pieces of root, stem, etc. They are hard, compact, yellowish-brown. Odor peculiar, aromatic. Taste bitter, unpleasant. *Resembling Galbanum.*—Ammoniacum, Asafœtida, and Benzoin; known by their different odors.

COMPOSITION.—The chief constituents are—(1) Volatile oil, $C_{10}H_{16}$, 6 to 9 per cent., isomeric with Turpentine. (2) A resin, 60 to 66 per cent. (3) Gum, 15 to 25 per cent. (4) Umbelliferone, $[C_9H_6O_3]$ in acicular crystals.

Preparation.

Emplastrum Galbani.—[Galbanum Plaster.] **Galbanum, 1; Ammoniacum, 1; Yellow Wax, 1; Lead Plaster, 8.**

ACTION AND THERAPEUTICS.

Galbanum acts like other substances containing volatile oils; it is usually combined with ammoniacum or asafetida. It is used externally as a plaster for its irritant effect, to aid the absorption of old inflammatory products, and internally it is given with asafetida as a carminative.

GELATINUM.

GELATIN.—The air-dried product of the action of boiling water on gelatinous tissues, as skin, tendons, ligaments, and bone.

CHARACTERS.—In translucent sheets or shreds. The solution in hot water is colorless and inodorous; it solidifies to a jelly on cooling. It is insoluble in Alcohol and Ether. Its aqueous solution is precipitated by Tannin.

[USES.]

Gelatin is useful as a basis for suppositories, pessaries, bougies, capsules, lozenges, and as a coating for pills.

GUTTA PERCHA.

GUTTA PERCHA.—The concrete juice of *Dichopsis gutta* and several other trees of the same natural order (nat. ord., *Sapotaceæ*). [*Habitat.*—South America.]

CHARACTERS.—Light brown, tough, flexible, plastic at a temperature above 120° F.; [48.8° C.] *Solubility.*—Not at all in water, Alcohol, alkalies, or acids. Almost entirely in Chloroform. Entirely in Oil of Turpentine, Carbon Disuphide, or Benzol.

Preparation.

Liquor Gutta Percha.—[Solution of Gutta Percha.] Gutta Percha, 1; Chloroform, 9; Lead Carbonate, 1; decant.

USES.

Gutta percha is used in making splints.

HEMIDESMUS.

HEMIDESMUS.—The dried root of *Hemidesmus Indicus* (nat. ord. *Asclepiadaceæ*). *Synonym.*—Indian Sarsaparilla. [*Habitat.*—India.]

CHARACTERS.—Cylindrical, twisted, longitudinally, furrowed; six inches long; their yellowish-brown corky layer easily separable from the rest of the bark, which is annularly cracked. Odor fragrant, taste sweetish [slightly acid]. *Resembling Hemidesmus.*—Sarsaparilla, Ipecacuanha, and Senega, but they have no cracks.

COMPOSITION.—The chief constituents are—(1) *Coumarin.* (2) *Tannin.* (3) *Hemidesmic Acid.*

Preparation, [*B. P.*]

Syrupus Hemidesmi.—[Syrup of Hemidesmus]. 1 in 10.
Dose, 1 to 2 fl. dr.; 4. to 8. c.c.

ACTION AND THERAPEUTICS.

Hemidesmus is used chiefly in India, and for the same purposes as Sarsaparilla. It is doubtful whether it has any particular action.

HIRUDO.

THE LEECH.—Two species are official, [B. P.] (1) *Sanguisuga medicinalis*, the speckled leech (belly greenish-yellow, spotted with black); (2) *Sanguisuga officinalis*, the green leech (belly olive-green, not spotted), (nat. ord., *Annelida*).

CHARACTERS of both species.—Body soft, smooth, [5] or more [cm.]

long, tapering to each end, plano-convex, wrinkled transversely, back olive-green, with six rusty-red longitudinal stripes. Each leech has a muscular disc at each end. In the center of the anterior one is a triradiate mouth, provided with three saws and two rows of teeth.

Action and Therapeutics.

Leeches are used to remove blood. They are usually applied over deep-seated organs when they are congested, and great relief is often afforded For example, three or four leeches near the liver, when that organ is enlarged in heart disease, or one or two behind the ear, when the tympanic cavity is inflamed, frequently do good. The leech being applied to the skin, the animal fixes itself by its sucker-like disc, makes a triradiate cut with its mouth, and draws into its body, which consequently becomes swollen, about a drachm and a half [6. c.c.] of blood. If this is not sufficient, a hot fomentation put on, after the animal is removed, may increase the quantity to half a fluid ounce; [15. c.c.]. The skin should be well washed with a little milk before the leech is applied Occasionally the hæmorrhage requires pressure, or some local styptic, as ferric chloride [or better styptic collodion], to stop it. If leeches have to be applied to the mouth, rectum, or uterus, leech glasses, which only allow the head to protrude, should be used.

HOMATROPINÆ HYDROBROMAS.

HOMATROPINE HYDROBROMATE. — $C_{16}H_{21}NO_3HBr$. [= 355.17]. The hydrobromate of an alkaloid prepared from Tropine. Homatropine is really Oxytoluyl-tropine.

Source.—(1) Tropine, $C_8H_{15}NO$, a derivative of Atropine, is heated with Oxytoluic Acid in the presence of Hydrochloric Acid; (2) Ammonia is added, and pure Homatropine shaken out with Chloroform; (3) the Chloroformic solution is evaporated; (4) the Homatropine is neutralized with Hydrobromic Acid.

Characters.—Small prismatic white crystals. *Solubility.*—1 in 10 of water, 1 in 133 of Alcohol.

Dose, $\frac{1}{120}$ to $\frac{1}{20}$ gr.; [.0005 to .003 gm.] subcutaneously.

Action and Therapeutics.

Homatropine has an action exactly similar, so far as we know,

to that of atropine. It is only used to dilate the pupil in ophthalmic practice, the advantage over atropine being that the dilatation produced by homatropine passes off in a quarter of the time. It may be applied as a solution, [1 in 120, of] distilled water. To dilate the pupil $\frac{1}{500}$ gr. [.0000013 gm.] is sufficient. Sometimes a solution in castor oil is used, for it is less likely to be washed out by the tears, but it may be rather irritating.

HORDEUM DECORTICATUM.

PEARL BARLEY.—The dried seed of *Hordeum distichon* (nat. ord. *Graminaceæ*) divested of its integuments. [*Habitat.*—Britain.]

CHARACTERS.—White, rounded, with a light longitudinal furrow.

COMPOSITION.—As of wheat.

Preparation, [*B. P.*]

Decoctum Hordei.—[Decoction of Barley.] *Synonym.*—Barley water. 1 to 15.

[Dose, freely.]

ACTION AND THERAPEUTICS.

Barley water forms a pleasant demulcent drink, especially if the throat be dry and sore.

LAUROCERASUS.

CHERRY LAUREL.—The fresh leaves of *Prunus laurocerasus* (nat. ord. *Rosaceæ*). [*Habitat.*—Europe.]

CHARACTERS.—Thick coriaceous, on short, strong petioles. Oblong or ovate, [12 to 16 cm.] long, tapering towards each end, recurved at the apex, distinctly but sharply serrated, dark-green, smooth and shining above, pale beneath. Prominent midrib with, on either side of it at the base, one or two grandular depressions. Inodorous, except on bruising, when they emit a ratafia-like odor.

COMPOSITION.—The chief constituents are—(1) *Laurocerasin*, a glucoside; it is a compound of Amygdalin and Amygdalic Acid. (2) *Emulsin*. By the same changes as in the case with Bitter Almond (*see* p. 530), in the presence of moisture, an oil, [Hydrocyanic] Acid and Glucose are formed.

Preparation, [*B. P.*]

Aqua Laurocerasi.—[Cherry Laurel Water.] Made by dis-

OLEUM ANTHEMIDIS.

OIL OF CHAMOMILE.—The volatile oil distilled from Chamomile flowers.

CHARACTERS.—Pale blue or greenish-blue, becoming yellowish-brown. Odor and taste like Chamomile.

COMPOSITION.—The chief constituents are—(1) A terpene, $C_{10}H_{16}$, and (2) an oxidized portion which readily yields *angelic* and *tiglinic* acids. (3) A bitter principle.

Dose, 1 to 4 m.; [.06 to .25 c.c.

ACTION AND THERAPEUTICS.

Internally, like other volatile oils, oil of chamomile is a stomachic and carminative.

OLEUM LAVANDULÆ.

OIL OF LAVENDER.—A volatile oil distilled from the flowers of ***Lavandula vera*** (nat. ord. *Labiatæ*). *Habitat.*—Britain.]

CHARACTERS.—A colorless or greenish or pale yellow [liquid having the aromatic odor of Lavender, a pungent, bitter taste, and a neutral reaction. Sp. gr., about 0.890, soluble in Alcohol.]

IMPURITY.—Oil of Spike.

COMPOSITION.—The chief constituents are a terpene and a stereopten.

Dose, 1 to 5 m.; [.06 to .30 c.c.]

ACTION AND THERAPEUTICS.

Oil of lavender has the same action as other aromatic volatile oils. It is used externally as a pleasant stimulating component of liniments.

OLEUM MYRISTICÆ EXPRESSUM.

[EXPRESSED OIL OF NUTMEG.]—A concrete oil obtained by expression and heat from Nutmeg.

CHARACTERS.—Orange brown or orange-yellow, mottled, firm consistence; odor like Nutmeg.

COMPOSITION.—The chief constituents are—(1) *Glyceryl Oleate*, $C_3H_5(C_{18}H_{33}O_2)_3$. (2) *Glyceryl Butyrate*, $C_3H_5(C_{11}H_7O_2)_3$. (3) *Glyceryl Myristate*, $C_3H_5(C_{14}H_{27}O_2)_3$. (4) A little volatile oil. (5) A little resin.

ACTION AND THERAPEUTICS.

The expressed oil of nutmeg is used in plasters as a sweet-smelling stimulant. A liniment, containing one part of the oil

to three of olive oil, is an elegant antiparasitic for mild cases of ringworm.

OLEUM PINI SYLVESTRIS.

FIR WOOD OIL.—The oil is distilled from the fresh leaves of *Pinus Sylvestris* (nat. ord. *Coniferæ*). [*Habitat.*—Russia.]

CHARACTERS.—Almost colorless. Odor aromatic. Taste pungent. Sp. gr., 0.870. *Solubility.*—1 in 7 of Alcohol.

COMPOSITION.—The same as that of Oil of Turpentine.

Preparation, [*B. P.*]

Vapor Olei Pini Sylvestris.—Vapor of Fir-Wood Oil. Fir-Wood Oil, 2; rub with Magnesium Carbonate, 1; add water, 24. Put 1 [fl. dr.; 4. c.c.] of this in half a pint [240. c.c.] of cold and half a pint [240. c.c.] of boiling water, in a vessel so arranged that air, drawn through the liquid, can be inhaled.

ACTION AND THERAPEUTICS.

The action of fir-wood oil is the same as that of oil of turpentine (*see* p. 446). But it is pleasanter to inhale, and forms a useful stimulating disinfectant expectorant inhalation in chronic bronchitis or laryngitis.

OLEUM RUTÆ.

OIL OF RUE.—The volatile oil distilled from the fresh herb of *Ruta graveolens* (nat. ord. *Rutaceæ.*) [*Habitat.*—Britain.]

CHARACTERS.—A light yellow oil, becoming brown on keeping. Taste sharp, bitter. Odor aromatic, disagreeable. Soluble [in equal weight of Alcohol. Sp. gr., about 0.880.]

COMPOSITION.—It is a mixture of several volatile oils.

Dose, 1 to 4 m.; [.06 to .25 c.c.]

ACTION AND THERAPEUTICS.

External.—Oil of rue is irritant and vesicant.

Internal. – In large doses it is a powerful gastro-intestinal irritant. It is hardly ever used for these purposes. It is eliminated in, and may be recognized by its odor in the urine, breath and perspiration. It is irritant to the kidneys, ovaries and uterus, and **excites the menstrual flow**; consequently it is given in amenorrhœa. From its stimulating action on the uterus rue has been used as an abortifacient, and fatal cases of poisoning from

tillation and *standardized* so that its strength is 0.1 per cent. of absolute Hydrocyanic Acid.

INCOMPATIBLES.—Metallic salts.

Dose, ½ to 2 fl. dr.; [2. to 8. c.c.]

ACTION AND THERAPEUTICS.

Aqua laurocerasi is not often employed; owing to the volatilization of the [hydrocyanic] acid, its strength is not constant. Its action is the same as that of dilu d hydrocyanic acid (*see* p. 292). It is used as a flavoring agen

MORI SUCCUS.

MULBERRY JUICE.—The juice the ripe fruit of *Morus nigra* (nat. ord. *Urticaceæ*). [*Habitat.*—Britain.]

CHARACTERS.—Well known.

COMPOSITION.—The chief constituents are—(1) Grape Sugar. (2) Malic Acid.

Preparation, [*B. P.*]

Syrupus Mori.—[Syrup of Mulberry.] Mulberry juice, 24; Sugar, 75; Alcohol, 1.

Dose, 1 to 2 fl. dr.; [4. to 8. c.c.]

[USES.

The juice of] Mulberries is used as a coloring and flavoring agent.

MORPHINÆ HYDROCHLORAS.

TINCTURA CHLOROFORMI ET MORPINÆ, [B. P., Tincture of Chloroform and Morphine.]—A close imitation of the proprietary medicine called Chlorodyne. (**A**) Dissolve Morphine Hydrochlorate 8 gr., [.50 gm.] and Oil of Peppermint 4 minims [.25 c.c.], in Alcohol, 1 [fl.] oz.; [30. c.c.]; add Chloroform, 1 [fl.] oz.; [30. c.c.], and Ether, 2 [fl.] dr.; [8. c.c.]. (**B**) Mix Fluid Extract of Liquorice, 1 [fl.] oz.; [30. c.c.]; Treacle, 1 [fl.] oz.; [30. c.c.]; and Syrup, 3 [fl.] oz.; [90. c.c.]. Mix A and B and add diluted Hydrocyanic Acid, ½ [fl.] oz.; [15. c.c.], and increase the bulk to 8 [fl.] oz.; [240. c.c.] by adding syrup.

Strength.—10 m. [.60 c.c.] contains chloroform 1¼ m. [.075 c.c.], Ether, ⅓ m. [.02 c.c.], morphine $\frac{1}{48}$ gr., [.0012 gm.].

Dose, 5 to 10 m.; [.30 to .60 c.c.]

[USES.

Tincture of Chloroform and Morphine is much used as an anodyne. This is a dangerous remedy and should be used with great care].

NECTANDRA.

BEBEERU BARK.—The bark of *Nectandra Rodiæi*, the Greenheart Tree (nat. ord. *Laurineæ*). *Habitat.*—British Guiana.]

CHARACTERS.—Flat, heavy pieces, [30 to 60 cm.] long, [5 to 15 cm.] broad, [6 to 19 mm.] thick. Externally grayish-brown, internally dark cinnamon brown, with longitudinal striæ. Hard, brittle, coarse-grained fracture. No odor. Taste bitter, astringent.

COMPOSITION.—The chief constituents are—(1) *Beberine*, [$C_{20}H_{42}N_2O_6$], official [B. P.] as the sulphate. (2) *Nectandrine.* (3) *Tannic Acid.*

BEBERINÆ SULPHAS.—Beberine Sulphate, $C_{20}H_{42}N_2O_6$ [$H_2SO_4 = 694.52$.]

SOURCE.—(1) Exhaust Bebeeru bark with dilute Sulphuric Acid, remove the excess of this by the addition of Lime, precipitation of Lime Sulphate, and filtration. (2) From the fluid, precipitate beberine with Ammonia. (3) Dry it, dissolve in Alcohol. (4) Distil off the Alcohol, dissolve the residue in Sulphuric Acid, purify and dry at 140° F.; [60° C.]

CHARACTERS.—Dark brown, translucent scales, yellow when powdered. Taste strong, bitter. *Solubility.*—1 in 80 of water, sparingly in Alcohol. As prepared it is a mixture of several alkaloids, chiefly Beberine and Nectandrine Sulphates.

INCOMPATIBLES.—Alkalies and their carbonates, potassium bromide, lime water, tartaric acid, tartrates, and astringent infusions and tinctures.

Dose, 1 to 10 gr.; [.06 to .60 gm.]

ACTION.

Bebeeru bark and beberine are bitter stomachics, having precisely the same action upon the stomach as calumba. They were introduced because they are slightly antipyretic and antiperiodic. Beberine is a feeble antiseptic.

THERAPEUTICS.

These substances are seldom used, as there are many other more convenient bitter stomachics, and their antipyretic and antiperiodic action is feeble.

[USES.]

This confection is used as a basis for pills.

SACCHARINUM.

SACCHARIN.—$C_6H_4.CO.SO_2NH$ = 168.65. *Synonyms.*—Glusidum, [B.P.] Benzoyl-sulphonic-imide. Glucusimide. Gluside.

SOURCE.—It is derived from Toluene, $C_6H_5.CH_3$ a derivative of coal tar, by a complicated process.

CHARACTERS.—A light, white, crystalline powder. In solution it has an intensely sweet taste; 1 of Saccharin is equal to 300 of cane sugar. *Solubility.*—1 in 400 of cold water; 1 in 28 of boiling water; 1 to 500 of Chloroform; 1 in 30 of Alcohol; 1 in 48 of Glycerin. It unites with alkaline hydrates and carbonates, evolving from the latter Carbon [dioxide], and yields soluble Saccharin, which has lost none of its sweetness, and is very soluble in water.

IMPURITIES.—Commercial Saccharin is not a pure or uniform product; it often contains less than 50 per cent. of actual Saccharin.

Dose, ½ to 2 gr.; [.03 to .12 gm.]

ACTION AND THERAPEUTICS.

Saccharin is an antiseptic, but is not used as such. It is employed as a **sweetening agent**, when from any cause, as diabetes, sugar cannot be taken. It may be given in tablets, or with sodium carbonate to form soluble solutions. An elixir is prepared, containing also sodium bicarbonate, alcohol and water. The strength is 1 to 160, and the dose is 5 to 20 minims; [.30 to 1.20 c.c.].

SAPO ANIMALIS.

CURD SOAP.—Soap made from Soda and a purified animal fat consisting principally of Stearin. It is chiefly Sodium Stearate.

[USES.]

Curd soap is used as a basis for plasters, liniments, pills and suppositories.

SODII ETHYLAS.

[**SODIUM ETHYLATE.**—NaC_2H_5O = 67.90.

SOURCE.—By solution of Metallic Sodium in Ethylic Alcohol and crystallization. $2Na+2C_2H_5OH=2NaC_2H_5O+H_2$.

CHARACTERS.—A deliquescent, caustic salt in white or whitish crystals.]

Preparation.

Liquor Sodii Ethylatis, [B. P., Solution of Sodium Ethylate.]—Sodium, 1; Ethylic Alcohol, 20. [This preparation has a Sp. gr., of 0.567.] *Strength.*—19 per cent. of Sodium Ethylate. It should be freshly made when wanted.

[USES.

Sodium ethylate is] used locally as a mild caustic to remove nævi and other growths.

SODII VALERIANAS.

SODIUM VALERIANATE.—$NaC_5H_9O_2$ = [123 77.]

SOURCE.—Make Valerianic Acid by distilling a mixture of Amylic Alcoholic, Sulphuric Acid, and Potassium Bichromate. Saturate the distillate, which contains Valerianic Acid, with Caustic Soda, and evaporate.

CHARACTERS.—White masses of a powerful valerian-like odor. *Solubility.*—Easily in both Alcohol and Ether.

Dose, 1 to 5 gr.; [.06 to .30 gm.]

[ACTION AND USES.

Sodium valerianate has the same action and is used for the same purposes as the other valerianates.]

SULPHONALUM.

SULPHONAL.—$C_7H_{16}S_2O_4$ = [227.59]. *Synonym.*—Diethylsulphondimethylmethane. $(CH_3)_2C(SO_2C_2H_5)_2$ = [227.59.]

SOURCE.—Mercaptan (Ethyl Hydrosulphide) is combined with Acetone to form Mercaptol, which by oxidation with Potassium Permanganate yields Sulphonal.

CHARACTERS.—Colorless, tabular crystals, inodorous, almost tasteless. *Solubility.*—1 in 450 of cold, 1 in 15 of boiling water, 1 in 90 of Alcohol or Ether, 1 in 3 of Chloroform.

Dose, 15 to 40 gr.; [1.00 to 2.40 gm.]

ACTION AND THERAPEUTICS.

Sulphonal is an **hypnotic.** It does not depress the heart, but kills by paralysis of respiration. The drug is given for the same class of cases as chloral, but as it is so insoluble, it is absorbed with difficulty and very slowly; hence it takes some

hours to act, and its action may be prolonged into the next day. It produces its effect most rapidly if the fluid, in which it is suspended, is hot. It has been known to produce [persistent] eruptions upon the skin. [Several fatal cases of poisoning by this drug have been reported, and, as well, severe general functional disturbances have followed its use.]

TI A.

TREACLE.—The uncrysta lue in the refining of sugar.
Treacle is contained in Tin formi et Morphinæ.

AC SES.

Treacle is used as a flavor t. It is slightly demulcent and laxative.

THUS AM ANUM.

FRANKINCENSE.—The conc Turpentine scraped off the trunks of *Pinus tæda*, Frankincense Pine, and *Pinus australis*, the Swamp Pine (nat. ord. *Coniferæ*). *Habitat.*—Southern United States.

CHARACTERS.—When fresh it is a soft, yellow, opaque, tough solid, becoming darker, dry and brittle by keeping. Odor and taste as of other Turpentines.

COMPOSITION.—It is an Oleoresin like other Turpentines.

[USES.]

Frankincense is used for the same purposes as resin (*see* p. 454).

UVÆ.

RAISINS.—The ripe fruit of *Vitis vinifera* (nat. ord. *Ampelidæ*), the grape-vine, dried in the sun, or partly by artificial heat. [*Habitat.*]—Spain.

COMPOSITION.—The chief constituents are—(1) *Grape Sugar*. (2) *Acid Potassium Tartrate*. (3) Other acids and salts.

ACTION AND THERAPEUTICS.

Raisins are used as sweetening agents, and are demulcent.

ZINCI SULPHOCARBOLAS.

ZINC SULPHOCARBOLATE.—$Zn(C_6H_5SO_4)_2+H_2O=$[illegible]

SOURCE.—Sulphocarbolic Acid is formed by adding Sulphu

Carbolic Acid. This is treated with Zinc Oxide; the Zinc Sulphocarbolate crystallizes out on evaporation.

CHARACTERS.—Colorless crystals, freely soluble in water.

USES.

Zinc sulphocarbolate is, like carbolic acid, an antiseptic, and may be used externally for that purpose. [It is used as an astringent for indolent or foul ulcers, and in subacute inflammations of mucous membrane, in solutions which are somewhat stronger than that of the sulphate.] It is not given internally.

APPENDIX NO. II.

NON-PHARMACOPŒIAL REMEDIES.

The following drugs, although not in either the U. S. P. or] B. P., are more or less often used.

[ACIDUM CAMPHORICUM.

CAMPHORIC ACID.—$C_{10}H_{16}O_4 = 199.54$.

SOURCE.—From Camphor (*see* p. 560) by oxidation with nitric acid.

CHARACTERS.—White, acicular, odorless crystals having a faintly acid taste. *Solubility.*—Nearly insoluble in cold, readily soluble in hot water, Alcohol, Ether and fatty oils.

Dose, 10 to 30 gr.; .60 to 2.00 gm.

USES.

Camphoric Acid is a mild, slightly stimulating and disinfecting astringent, used for chronic inflammations of the pharynx, larynx and nose. Internally, it has been administered for colliquative sweating, *e. g.*, that of pulmonary tuberculosis. The daily amount of from 15 to 75 gr.; 1. to 5. gm., should be given in the evening in divided doses at short intervals, either dry upon the tongue or in starch wafers.

ADONIDINUM.

ADONIDIN.—A glucoside obtained from *Adonis Vernalis* (nat. ord. *Ranunculaceæ*). *Synonym.*—False Hellebore. *Habitat.*—Northern Europe and Asia.

CHARACTERS.—This glucoside occurs as a somewhat hygroscopic, canary-colored powder, of intensely bitter taste, soluble in water and Alcohol; insoluble in Ether, Chloroform and Benzin.

Dose, 1/6 to 1/3 gr.; .01 to .02 gm.

ACTION AND USES.

Adonidin markedly increases the arterial pressure while decreasing the pulse rate. The primary rise is chiefly of cardiac

origin, the slowing of the rate is due to stimulation of the inhibitory nerves. The late fall of blood-pressure is due, at least in great part, to vaso-motor paralysis. In its action it is more prompt than digitalis, and, according to Durand, does not have a cumulative action. If it is diuretic, it is chiefly through its effects upon the circulation. It is used for the same class of cases as digitalis.

ÆTHYL BROMIDUM.

ETHYL BROMIDE.—$C_2H_5Br = 108.70$. *Synonyms.*—Æther bromatus. Hydrobromic Ether. This must be carefully distinguished from Ethylene Bromide.

SOURCE.—From a well-cooled mixture of Sulphuric Acid, 12; and Alcohol (Sp. gr., 0.816), 7; to which powdered Potassium Bromide, 12, is added; this mixture is distilled. The distillate is washed by agitation, first with a 5 per cent. solution of Potassium Carbonate, then with an equal volume of water; finally it is dehydrated with Calcium Chloride and redistilled.

CHARACTERS.—A colorless, highly refractive, very volatile liquid having a strong ethereal odor and a sweetish, warm taste. Sp. gr., 1.445 to 1.450. It is easily decomposed by light and air.

ACTION AND USES.

Ethyl Bromide was introduced to the profession in 1880 as the most agreeable and rapid anæsthetic. Several fatal cases after its administration were reported. Recently, however, Cumston has recommended its use, when pure, in doses of from 3 fl. dr.; 12. c.c. (child of two years), to 6 fl. dr.; 24. c.c. (adult), for surgical anæsthesia. The following precautions should be observed: Food, even a glass of milk, is absolutely forbidden on the day of operation. The mask should perfectly cover the mouth and nose, so that no air is allowed to enter. The entire dose should be given at once. When narcosis is complete, the mask should be removed, and under no consideration be re-applied. Do not prolong the administration over one minute. Sleep is obtained in from twenty to thirty seconds, and lasts from two to three minutes, sometimes longer. The contra-indications to its use are dangerous lesions of heart, lungs, or kidneys.

ÆTHYLENE BICHLORIDUM.

ETHYLENE BICHLORIDE. — $C_2H_4Cl_2$=98.68. *Synonyms.*— Ethene Chloride. Dutch Liquid.

CHARACTERS.—A colorless, volatile liquid possessing an odor and taste resembling that of Chloroform. It has a sp. gr. of about 1.27. *Solubility.*— Sparingly in water; freely in Alcohol and Ether.

USES.

Ethylene bichloride is used as an anæsthetic, and is much safer than chloroform, but is more costly. It is more rapid in action, and causes no excitement during nor after its administration; there is more rapid recovery from it. It causes so much irritation of the throat that it is used with difficulty. As a local anæsthetic, it has been applied to the seat of pain in neuralgia.]

AMMONIO-MERCURIC CHLORIDE.

SAL ALEMBROTH.—A double Mercury and Ammonium Chloride.

SOURCE.—Mix 271 parts of [Corrosive Mercuric Chloride] with 107 of Ammonium Chloride, both in solution, and evaporate.

CHARACTERS.—Flattened rhombic prisms, freely soluble in water or glycerin. It contains one molecule of [Corrosive Mercuric Chloride] combined with two of Ammonium Chloride. Three grains [.20 gm] of Sal Alembroth contain two grains [.12 gm.] of [Corrosive Mercuric Chloride]. It is a very powerful antiseptic, but does not combine with albumin so readily as [Corrosive Mercuric Chloride], and is therefore less irritating.

ACTION AND THERAPEUTICS.

Sal alembroth gauze (containing 1 per cent.) and sal alembroth wool (2 per cent.), both tinted with aniline blue, which is bleached by the discharge, so that it is easy to see if it has soaked through, are much used to dress wounds antiseptically.

Sal alembroth injections (1/3 gr.; [.02 gm.] in 10 minims, [.60 c.c.]; of water) are a convenient non-irritating form in which to use mercury subcutaneously in syphilis. The precautions mentioned on p. 202 should be observed.

AMYL COLLOID.

AMYL COLLOID.—The composition of this is Amyl Hydride, 480; Aconitine, 1; Veratrine, 6; Collodion to 960. It is a fluid preparation.

Action and Therapeutics.

Amyl colloid is painted on the skin over painful areas in neuralgia, sciatica, etc. It is an elegant method of obtaining the local anæsthetic action of aconitine and veratrine, which is aided by the evaporation of amyl hydride, [but it is extremely difficult to make a clear solution.]

[AMYLENUM HYDRATUM.

AMYLENE HYDRATE.—$(CH_3)_2C_2H_5COH$=87.81 *Synonyms.*—Dimethyl-ethylcarbinol. Tertiary Amylic Alcohol.

Source.—By the action of Sulphuric Acid on Amylene, separation of the Amylene-sulphuric Acid, dilution, filtration, neutralization with Milk of Lime or solution of Soda, and fractional distillation.

Characters.—A limpid, colorless, oily liquid, of a peculiar penetrating odor. Sp. gr., 0.815. *Solubility.*—In 8 parts of water; readily in Alcohol, Ether or Chloroform.

Dose, ½ to 1 fl. dr.; 2. to 4. c.c.

Action and Uses.

Amylene hydrate is a hypnotic, about midway in power between chloral and paraldehyde, having a pleasanter taste than the latter. The sleep is generally natural, and the awakening prompt and complete. It is a safe hypnotic, having no action upon the heart or respiration, and it may have also anodyne properties. It can be administered in wine, raspberry syrup, or simply in water. It has been given hypodermatically, with one-half its volume of alcohol. After continued use it is apt to disagree with the stomach.

APIOLUM.

APIOL.—$C_{12}H_{14}O_4$ = 221.48. A body obtained from the fruit of *Petroselinum sativum* (nat. ord. *Umbelliferæ*). *Habitat.*—Southern Europe; cultivated.

Source.—The fruit is exhausted with Petroleum Benzin, the solvent evaporated, the residue treated with strong Alcohol, on the evaporation of which Apiol is left.

Characters.—A colorless oil, becoming turbid without congealing at —12° C; 10.4° F., having an acid reaction, the odor of parsley, and a pungent taste. Sp. gr., 1.070. *Solubility.*—Easily in Alcohol, Ether, Chloroform, and Glacial Acetic Acid.

Dose, 10 to 15 m.; .60 to 1.00 c.c., in capsules.

Action and Uses.

Apiol is useful in amenorrhœa, scanty menstruation and dysmenorrhœa when these conditions are due to a want of ovarian activity; that is, where direct emmenagogues are required.]

ARISTOLUM.

ARISTOL.—[$C_{20}H_{24}O_2I_2 = 548.38$]. *Synonyms.* — Dithymol-diiodide. [—Annidalin.

Source.—It is prepared by the decomposition of a solution of Iodine in Potassium Iodide, by Thymol dissolved in a solution of Sodium Hydroxide. The precipitate is washed with water and dried. It contains 45.8 per cent. of Iodine.

Characters.—An Amorphous brownish-red, almost tasteless powder, of a slight, peculiar, iodine-like odor. *Solubility.*—Insoluble in water and Glycerin, soluble in Ether and Chloroform, with difficulty soluble in Alcohol; it is readily taken up by fixed oils and Petrolatum.

Action and Uses.

It is used for the same purposes as is iodoform (*see* p. 289) in various skin diseases, as lupus, psoriasis and for tertiary syphilis, both in ointment, lanolin, flexible collodion and as a powder. It has the very great advantage of being nearly free from odor.

ASAPROLUM.

ASAPROL.—$(C_{10}H_6OHSO_3)_2Ca + 3H_2O = 538.83$. *Synonym.*—Calcium Beta-naphtol alpha-monosulphonate.

Source.—By action of free Sulphuric Acid on Beta-naphtol, neutralizing this product with Calcium Carbonate, concentration and crystallization.

Characters.—A colorless, or yellowish-white, crystalline powder, of a slightly bitter taste. *Solubility.*—In 1.5 parts of water; in 3 parts of Alcohol.

Dose, 15 to 6 gr.; 1. to 4. gm.

Uses.

Asaprol is an useful, soluble and safe antiseptic. It is valuable in epidemic influenza, relieving the pain and reducing the fever, not giving rise to prostration nor interference with the heart or respiration. In atonic dyspepsia, when fermentation alternates with acid eructations, it has achieved brilliant results. In chronic rheumatism it will relieve the pain of an acute exacerbation. In

acute rheumatism, although it does not present the disadvantages of the salicylates, it is not so useful, nor so uniformly successful.

BISMUTHI SALICYLAS.

BISMUTH SALICYLATE.—$Bi(C_7H_5O_3)_3Bi_2O_3 = 1084.59$.

SOURCE.—It is prepared by diluting a Glycerin solution of crystallized Bismuthous Nitrate with water, and decomposing this with a concentrated aqueous solution of Sodium Salicylate; the precipitate is well washed with hot water and carefully dried. It contains about 76 per cent. of Bismuth Oxide and 24 per cent. of Salicylic Acid.

CHARACTERS.—It is a soft, white powder. *Solubility*—Insoluble in water, Glycerin and Ether, but soluble in acids.

Dose, 5 to 20 gr.; .30 to 1.20 gm].

ACTION AND USES.

Bismuth salicylate is an unirritating, intestinal antiseptic, and as such is of great value in the treatment of diarrhœas, typhoid fever, gastric and intestinal catarrhs.

BISMUTHI SUBGALLAS.

BISMUTH SUBGALLATE.—$C_6H_2(OH)_3CO_2Bi(OH)_2 = 409.41$.

Synonym.—Dermatol.

SOURCE.—By dissolving Bismuth Subnitrate, 15; in glacial Acetic Acid, 30; adding water, 200 to 250; and filtering. To the filtrate, add with constant stirring, Gallic Acid, 5; wash the precipitate by decantation, and dry.

CHARACTERS.—It is an impalpable saffron-yellow powder, odorless, and permanent. *Solubility.*—Insoluble in all ordinary solvents.

Dose, 5 to 10 gr.; .30 to .60 gm.

ACTION AND USES.

Bismuth subgallate is non-toxic and non-irritant. Used like iodoform, it has a drying and anti-bacterial effect upon wounds. Internally it has been used in fermentative dyspepsias, and the diarrhœa of tuberculosis and typhoid fever. Excellent as a dusting powder, or as an ointment (1 in 10 of vaseline, etc.), it may be used in gauze, 10 per cent. It is non-stimulant, and therefore valueless in chronic or torpid ulcerations.

Other organic preparations of bismuth have come into use. These are Phenol-, Beta-naphtol-, and Tribromophenol-Bismuth.

Used in the same dose as the subgallate, they are valuable as disinfectants of the alimentary canal, whenever indicated. The last has been strongly recommended by Heuppe in Asiatic cholera.

BROMOFORMUM.

BROMOFORM.—$CHBr_3 = 252.25$. *Synonym.*—Tribromomethane.

SOURCE.—By the action of Sodium Hypobromite, which is obtained when Bromine is added to a solution of Sodium Hydroxide, on Acetone.

CHARACTERS.—A clear, colorless liquid, of a peculiar odor, and a sweetish taste. Sp. gr., 2.90. *Solubility.*—Slightly in water, but readily in Alcohol. It must be kept protected from light.

Dose, 1 to 5 m.; .06 to .30 gm.

ACTION AND USES.

Bromoform is an anæsthetic. It has been used as a remedy of great value for whooping cough, for which its pleasant taste and convenience of administration gives it great advantage. It can be given—bromoform, 1; in a mixture of alcohol, 8; glycerin, 48; and a compound tincture of cardamom, 8. Each fluid drachm: 4. c.c., contains about 3 minims; .20 c.c. of the drug. Cases of poisoning have been reported, so that it must be used with care.

CACTUS.

CEREUS GRANDIFLORUS. *Synonym.*—Night-blooming Cereus. The stems of *Cactus Grandiflorus* Linné (nat. ord. *Cactaceæ*). *Habitat.*—Tropical America; cultivated.

CHARACTERS.—Its branches, or stems, are scandent, diffuse, radicant, slightly 5 to 7 angular; areolæ, 5 to 12 spinulose; spinules short, 4 to 6 mm. long, nearly equalling the whorl; flowers large, nocturnal, white, pleasantly and strongly fragrant; the calyx is about 15 to 20 cm. in diameter; the inside being of a splendid yellow, the outside is of a dark brown; the petals of a pure white; and there is a vast number of recurved stamens in the centre.

CONSTITUENT.—It is believed to contain an alkaloid, *Cactine*, but this has not been satisfactorily demonstrated.

Preparation.

Fluid Extract of the fresh flowering branches.

Dose, 10 to 30 m.; .60 to 2.00 c.c.

Action and Uses.

The action of cactus is upon the intra-cardiac ganglia and accelerator nerves, through the cardiac plexus of the sympathetic, and there is not any interference with the inhibitory nerves, nor, indeed, does its administration produce any very marked vaso-motor changes. It shortens the ventricular diastole, and increases the blood-pressure. It is useful in cardiac weakness, that is, relative incompetency; in convalescence from typhoid fever; in simple eccentric cardiac dilatation; in functional cardiac diseases, from tea coffee. tobacco and alcohol, dyspepsia, neurasthenia of the climacteric, sexual exhaustion; in the "slow heart," from over-stimulation of the pneumogastric or degeneration of the muscular wall of the ventricles. It is of very great use in aortic regurgitation, but is absolutely contra-indicated in mitral stenosis, thus being of value in those cases where the use of digitalis is inadmissible. It has a sphere of action entirely of its own, not, however, replacing the digitalis or the aconite group, but it is useful in many cases where these drugs are not only dangerous, but absolutely contra-indicated.

CHLORALOSE.

CHLORALOSE.—$C_8H_{11}Cl_3O_6 = 259.85$. *Synonym.*—Anhydroglucochloral.

Source.—By heating together Anhydrous Chloral and Glucose, the soluble Chloralose is formed which crystallizes. $C_2HCl_3O + C_6H_{12}O_6 = C_8H_{11}Cl_3O_6 + H_2O$.

Characters.—In small crystals, having a bitter and disagreeable, but not acrid taste. *Solubility.*—Freely in hot, slightly in cold water.

Dose, 2 to 8 gr.; .12 to .50 gm.

Action and Therapeutics.

Chloralose will produce sound sleep in which sensibility is not lost, although the reflex activities are greater than usual. The awakening is without unpleasant effects. Ten grains; .60 gm., have produced profound unconsciousness. On account of its bitter taste it is best given in capsules.]

CHLORALUM FORMAMIDATUM.

CHLORAL FORMAMIDE.—[$CCl_3CH.OH.CONH_2$=191.95. *Synonym.*—Chloralamide.

SOURCE.—By the combination of Chloral and Formamide. $CCl_3CHO + CHONH_2 = CCl_3CH.OH.CONH_2$.]

CHARACTERS.—Shining colorless crystals, [without odor and of a slightly bitter taste. *Solubility.*—Slowly, in about 20 parts of water, in 1 5 parts of Alcohol, and in weak acid solutions. It should not be heated over 140° F.; 60° C., or mixed with alkalies, for, in either case, it decomposes into Chloral.

Dose, 10 to 30 gr.; .60 to 2.00 gm.]

ACTION AND THERAPEUTICS.

Chloralamide is an excellent hypnotic, producing calm, refreshing sleep without any bad after-effects. Frequent use does not necessitate an increased dose, nor, as far as known, is any habit contracted. It does not relieve pain, but is equally serviceable for all varieties of insomnia, unless due to pain. If possible it should not be given as a powder, for it is then so very slowly absorbed that probably some of it is decomposed in the intestines or stomach; occasionally, powdered chloralamide has been administered in the evening, the patient has not slept during the night, but has slept all the next day, because the drug has been so slowly absorbed. The best way to give it is to dissolve it in a little alcohol. The patient may be told to dissolve 20 gr.; [1.20 gm.] or more, in sufficient brandy, to add water not above 130° F.; 54.4° C., and drink it before going to bed. Some specimens are very insoluble, and must be suspended. It is said that 10 minims [.60 c.c.] of aromatic sulphuric acid added to 1 fl. oz.; [30. c.c.] of water will dissolve 30 gr.; [2. gm.] of chloralamide, but this is not always true. It acts if given as an enema.

[COCILLAÑA.

COCILLAÑA.—The bark of *Sycocarpus Rusbyi* (nat. ord. *Maliaceæ*). *Habitat.*—Bolivia.

CHARACTERS.—The bark is thick, and ash-colored, becoming rough only with considerable age; inner surface is grayish-yellow; the odor is slight, but peculiar; taste unpleasant (not bitter), slightly nauseous.

COMPOSITION.—Its chief constituents are—(1) *Rusbyine* (Eccles), an alkaloid. (2) *Two Resins.* (3) Tannic Acid. (4) Calcium Oxalate.

Preparations.

1. **Fluid Extract. Dose, 5 to 25 m.; .30 to 1.50 c.c.**
2. **Syrup. Dose, 1 to 2 fl. dr.; 4 to 8. c.c.**
3. **Tincture. Dose, ½ to 2 fl. dr.; 2. to 8. c.c.**

ACTION AND USES.

Cocillaña acts upon muciparous glands, increasing their activity; on the bronchial mucous membrane, causing expectoration; on the intestinal mucous membrane, producing a laxative effect; it also slightly increases the appetite; it slightly strengthens the heart beat, and the pulse, but does not stimulate the respiratory centre. The syrup does not act as a laxative, while the resins are distinctly purgative. It is of very great value as an expectorant, preferable to ipecacuanha, in that it does not so readily cause nausea and a metallic taste in the mouth, and assists the regular movement of the bowels. If, however, nausea should be produced, it is very persistent. Its action is fully established three to six hours after administration, and persists at least for six hours. It can, in many cases, be substituted for apomorphine, ammonium carbonate and for many other drugs, classed, with more or less reason, as expectorants.

COTO.

COTO BARK.—The bark of *Drimys Winteri*, Foster, var. *granatensis*, Eichler. *Habitat.*—Venezuela.

CHARACTERS.—In irregular pieces, outer surface irregular as well as the inner surface; color cinnamon-brown; upon fresh cross-section the bark is seen to be filled with yellowish spots, except in the outer portions; odor aromatic, especially if bruised; the powder is very pungent. *Resembling Coto Bark*—Paracoto Bark, which has a less powerful odor and taste; and is marked with deep, whitish furrows upon its surface.

COMPOSITION.—The chief constituents are—(1) *Cotoin, see* below. (2) A volatile oil. (3) A resin. (4) A volatile alkaloid of a peppery taste, probably propylamine. (5) *Piperonylic Acid*, $C_8H_6O_4$, which is also contained in Paracoto Bark.

Dose, 1 to 10 gr.; .06 to .60 gm.

Preparations.

1. Abstract. Dose, ½ to 5 gr.; .03 to .30 gm.
2. Tincture. Dose, 1 to 10 m.; .06 to .60 c.c.
3. Fluid Extract. Dose, 2 to 6 m.; .12 to .35 c.c.

COTOIN.—$C_{22}H_{18}O_6$=377.10.

CHARACTERS.—A pale yellow, amorphous powder, or in minute, curved, white, fusible prisms. *Solubility.*—Slightly in water, soluble in Alcohol, Ether, and Chloroform. It has a biting taste, and the dust is irritating to the nostrils.

Dose, 1 to 2 gr.; .06 to .12 gm.

PARACOTOIN.—$C_{19}H_{12}O_6$=335.19. It is extracted from Paracoto Bark.

CHARACTERS.—It is in yellowish-white scales, without taste. *Solubility.*—Soluble in Ether, Chloroform, boiling Alcohol, and somewhat in boiling water, but from this it separates on cooling.

Dose, 1 to 3 gr.; .06 to .20 gm.

ACTION AND USES.

Coto is not astringent, but because it produces absorption, coto bark, cotoin and paracotoin (the last being weaker than cotoin) have established a reputation as remedies for diarrhœa, whether infantile, in phthisis or in typhoid fever. It also checks salivation and night-sweats. It should not be combined with Mistura Cretæ.]

CREOLINUM.

CREOLIN.

SOURCE.—[Creolin is derived from coal by dry distillation, and consists of a mixture of the sodium salts of some resinous acids with Creolin Oil and Pyridines.

CHARACTERS.—A dark brown, syrupy alkaline liquid, containing in solution the higher homologues of Phenol. It forms a turbid, milky mixture with water, which has the characteristic odor of the preparation.

Dose, 1 to 5 m.; [.06 to .30 c.c.]

[ACTION AND USES.

Creolin is a harmless, cheap, non-irritating but powerful antiseptic, frequently used in place of carbolic acid. It is used pure, in 2 per cent. solution, in an ointment or as a soap, 10 per cent. It has been given internally in gastric fermentation, dysentery and typhoid fever.]

[CURARE.]

CURARE. *Synonyms.*—Woorara. Wourari. Urari. Wourali. The South American arrow poison, prepared from species of *Strychnos* and other plants.

CHARACTERS.—A blackish-brown, dry extract, [brittle or hygroscopic], with a bitter taste. *Solubility.*—Almost completely in diluted Alcohol.

COMPOSITION.—It contains an extremely active poison, *Curarine* or *Curarina*, [$C_{18}H_{35}N$,] a yellowish-brown powder, intensely bitter.

Dose, $\frac{1}{25}$ to ½ gr.; [.0025 to .03 gm.]

Preparation. (Brit. Pharm. Conference.)

Injectio Curaræ Hypodermica.—Hypodermatic Injection of Curara. Curare, 1; add distilled water to form a thin paste. Put in a funnel plugged with absorbent wool, and gradually add more water till 12 parts are obtained.

Dose, 1 to 6 m.; [.06 to .35 c.c.] (subcutaneously).

Lamellæ or discs, each containing $\frac{1}{10}$ of a grain; [.003 gm.] are also prepared. They are dissolved in a few minims of water before injection subcutaneously.

ACTION AND THERAPEUTICS.

The physiological action of curare, by which it paralyzes the end plates of the motor nerves of voluntary muscle, is well known. It has been given successfully in tetanus, and is probably one of the most useful of all the drugs employed for this very fatal disease.

[DAMIANA.

DAMIANA.—The leaves of several plants, *Bigelovia veneta* Gray, *Turnera microphylla* De Candolle, var., *Turnera aphrodisiaca* (nat. ord. *Turneraceæ*). *Habitat.*—Western North America.

COMPOSITION.—The chief constituents of the last as given by Rantzer are —(1) *A Volatile Oil*, 1 per cent., amber-colored, having an aromatic odor, and a warm camphoraceous taste. (2) Tannin. (3) Two resins.

Dose, ½ to 1 oz.; 15. to 30. gm.

USES.

Damiana has enjoyed considerable reputation as a remedy for sexual atony. Some observers believe it to be only tonic. It is best administered as a fluid extract, in the dose of one-half drachm; 2. c.c.]

DUBOISINÆ SULPHAS.

DUBOISINE SULPHATE.—The Sulphate of the Alkaloid Duboisine obtained from the leaves of *Duboisia myoporoides* (nat. ord. *Solanaceæ*). Duboisine is probably indentical with Hyoscine (*see* p. 327).

Action and Therapeutics.

The action of duboisine is like that of atropine, and ophthalmic discs containing $\frac{1}{5000}$ of a grain ; [.000013 gm.] are used to dilate the pupil.

ERYTHROPHLŒUM.

SASSY BARK. *Synonyms.*—[Mancona Bark.] Ordeal Bark. Saucy Bark. The bark of *Erythrophleum guineense* (nat. ord. *Leguminosæ*), [*Habitat.*]—Africa.

Characters.—[In flat or curved pieces of irregular size, about 6 mm. thick, covered externally with an uneven warty and fissured corky layer, or deprived of the same, of a dull brown color. It is hard, brittle, of a fibrous texture, internally with pale yellowish brown spots, inodorous, of an astringent, somewhat bitter and acrid taste, and when powdered excites sneezing.

Compositon.—The active principle is *Erythrophlœine*, a [colorless alkaloid, soluble in water and Alcohol.]

Preparation. (Brit. Pharm. Conference.)

Tinctura Erythrophlœi.—[Tincture of Erythrophlœum.] Sassy Bark, 1 ; Rectified Spirit, 10.

Dose, 5 to 10 m. ; .30 to .60 c.c.

Action and Therapeutics.

The action of erythrophlœum is the same as that of digitalis, and it may be used for the same class of cases. [In organic cardiac disease its effect in slowing the pulse and in increasing the urine is by no means constant nor lasting.] It is, however, more likely to cause vomiting.

[EUROPHEN.

EUROPHEN. *Synonym.*—Di-isobutyl-orthocresol iodide.—$C_{22}H_{29}O_2I$ = 450.79. This should be distinguished from Europhin.

Source.—It is prepared in the same way as is Aristol (*see* p. 632), except that Isobutyl-orthocresol is used in place of Thymol.

Characters.—It is an amorphous, golden-yellow powder of a slightly

saffron-like odor, and contains about 28 per cent. of Iodine. *Solubility.*—In Alcohol, Ether, and in about 4 parts of Olive Oil; insoluble in water or Glycerin.

Action and Uses.

Europhen is permanent when dry, but when moistened splits up into iodine and a new soluble iodine compound. It is a powerful germicide and bactericide, and is used for wounds and for like purposes as is iodoform, and in the same quantities.

EXALGINUM.]

EXALGIN.— [$C_6H_5N(CH_3)CH_2CO = 148.70$.] *Synonym.*—Methyl Acetanilid.

[Source.—By warming together Monomethylaniline and Acetyl Chloride.

Characters.—Colorless, acicular needles, with a slightly] saline taste. *Solubility.*—In 60 parts of water, freely in Alcohol.

Dose, ½ to 3 gr.; [.03 to .20 gm.]

Action and Uses.

Exalgin is a powerful analgesic. Often it relieves when many other drugs have failed. Medicinal doses hardly ever cause depression. Large doses are antipyretic, but are not used for this purpose. [It is used for neuralgia, migraine, sciatica, the pains of rheumatism, and, of late, for chorea. Several severe cases of poisoning having been reported, the usual dose should not be exceeded.]

[EXTRACTUM CARNIS.

EXTRACT OF MEAT.—This preparation has for its object the obtaining the nutritive matters of the flesh of animals in a permanent, concentrated state.

Source.—Equal parts of meat and cold water. Straining, evaporation and straining.

Characters.—Reddish-brown in color, of a slightly acrid taste, and frequently of a disagreeable odor.

Composition.—100 parts of meat yield 25 of extract. It is rich in nitrogenous principles, but contains neither fat nor gelatin. The method of Liebig has been followed, with variations, by a large number of manufacturers. The product, however, by no means represents the nutritive qualities of the meat itself, because the albumin and fibrin are largely wanting, besides an

endeavor is put forth to get rid of the gelatin and fat. Of late the attempt has been made to retain these important nutritive principles. The beef meal which was used by Debove in his method of forced feeding (gavage) was practicably desiccated beef; but it did not have its highest nutritive value because it was, to a considerable extent, composed of insoluble matters. The classical studies of Wurtz showed that in the juice of the *Carica papaya* (nat. ord. *Passifloræ*) was a principle, called papain, capable of converting albuminoids into soluble albumoses and peptones. The fact that a similar vegetable digestive principle exists in the juice of the pine-apple and allied plants of the nat. ord. *Bromeliaceæ*, as was first shown by Marcaño, has been utilized in the manufacture of the Mosquera-Julia beef meal, where the process of digestion is carried on before desiccation, or it may be made as a jelly. The advantages of a vegetable over an animal pepsin, the greater acceptability to weak stomachs, the avoidance of the unpleasant taste and the disagreeable odor, and absence of bitterness are very important. By this method the preparation contains only ten per cent. of water, has four times the amount of albuminoid matter present in average lean beef, one-half of which is already in an assimilable form, and about three times as much fat, in addition. Besides, it is very convenient for administration.

Action and Uses.

Extract of meat is useful as a nutrient and a stimulant in relieving prostration and fatigue. The solution seasoned with capsicum is valuable in alcoholic excess and delirium tremens. In the infantile bowel disturbances, when milk must be forbidden, it is often indicated. In phthisis it will frequently sustain the patient; in the aged it will support life without taxing the digestive powers. The amount to be used should be regulated by the age and condition of the patient.

EXTRACTA ORGANICA.

ORGANIC EXTRACTS.—*Testicular Juice.* Brown-Séquard believed that the tissues and other organs supply to the body a natural ferment, which is essential to health. When this ferment is absent the vital forces degenerate. To supply this ferment, the testicle of a bull is sterilized, macerated in aseptic Glycerin and filtered by the method of D'Arsonval, being sterilized under Carbon Dioxide Gas, of thirty atmospheres pressure. Under the hypodermatic injection of this fluid, the functions of organic life are performed with new vigor. Favorable reports of its use in many hundred cases of organic nervous diseases have been placed on record. The dose is 10 to 20 m.; .60 to 1.20 c.c.

Thyroid Extract.—The use of Thyroid Extract, introduced by Murray, or feeding with fresh minced sheep's thyroid, has been of great benefit in the disease known as myxœdema, and also in sporadic cretinism. The dose is 5 to 10 m.; .30 to .60 c.c., or about one-third to one-half of a sheep's thyroid.

Brain Extract.—Paul has used the gray matter of a sheep's brain prepared in the same way as is the testicular fluid. The results have been very favorable. The dose is 15 m.; 1.00 c.c. In this country the brain of the ox has been used, prepared by washing with Boric Acid solution, and prolonged maceration in solution of Boric Acid, Alcohol and Glycerin, with filtration. The dose is 5 m.; .30 c.c. This preparation has been used with excellent, although not always constant results. Apparently the indications for the use of these extracts are not fully understood. In their employment the most scrupulous antisepsis must be insisted upon, and the dose carefully watched. Febrile reaction, prostration, and in some cases cardiac weakness, have followed their use.

Serum Therapy.—Another form in which organic extracts have been used consists in the administration of serum from animals rendered immune to the diseases for which this remedy (antitoxin) is given. The best results in tetanus have been obtained with the antitoxin of Tizzoni, prepared from the blood serum of animals; rabbits or dogs. In pneumonia not only has the serum of immunized rabbits been successfully employed, but also the serum of patients convalescent from the disease. In typhoid fever similar experiments have been carried out, but the results are inconclusive, although it is demonstrated that this treatment is harmless. In tuberculosis much work is being done, but as yet no definite statements can be made.

During the past year the accumulated experience in the use of diphtheria antitoxin has been extended, and the literature seems to be generally favorable. It is claimed that under the use of antitoxin, which is obtained from the serum of immunized horses, the temperature falls, the membranes cease to extend and may rapidly disintegrate, and there is a rapid improvement in the general condition. Statistical inquiry shows a very great lowering of the mortality. On the other hand, erythematous manifestations are quite frequent after injection of the remedy, often there are noted joint pains, and finally somewhat rarely there has been observed an irregular temperature range and consecutively emaciation and death; evidently pointing toward an acquired septicæma. Further in a few cases an early fatal result has been reported. Browne and Benda both have shown that in fatal issue, a nephritis, in the majority of cases, is the cause of death, and clinically a hæmorrhagic nephritis is by no means rare. The matter may be summed up by stating that the lowering of mortality by the use of antitoxin is incontestable, although there is some room for doubt as to the exact rôle of the remedy in producing this result. Inasmuch as this remedy militates solely against the infection of the Klebs-Lœffler bacillus and

clinically most cases of diphtheria are cases of mixed infection, the usual local antiseptic and general supporting measures must not be omitted. The dose is usually 5 fl. dr.; 20. c.c., of an antitoxin of the strength of 50 immunizing units per c.c. for an advanced case, one-half the amount of the same strength for an incipient case of diphtheria; but these doses are often exceeded. As a prophylactic 1½ fl. dr.; 5 c.c., of antitoxin of 30 immunizing units per c.c. may be used (Krieger). So far as prophylaxis is concerned, the question is still *sub judice*, many failures are reported, and indeed instances of reinfection have occurred even after suitable doses of antitoxin have been used during a previous attack. While the reported cases point toward a notably lowered death-rate, the dangers consecutive to the hypodermatic use of antitoxin are by no means to be underestimated.

FABIANA.

PICHI.—The branches of the woody shrub, *Fabiana imbricata* (nat. ord. *Solanaceæ*). *Habitat.*—Peru and Chili.

CHARACTERISTICS.—A woody shrub growing on rocky hill-tops, with plume-like sprays, the small densely-crowded leaves much resembling those of a conifer. The branches and leafy branchlets are resinous, with an aromatic odor and taste.

COMPOSITION.—It contains (1) *Fabianine*, a bitter alkaloid. (2) A Resin. (3) A crystalline substance. (4) An essential oil.

Preparation.

Fluid Extract. Dose, 5 to 40 m.; .30 to 2.50 c.c.

THERAPEUTICS.

Pichi is a diuretic of great value in inflammation of bladder and catarrh of the urinary tract. It should not be used in structural disease. It is best prescribed in combination with an alkali, as sodium carbonate.

FERRUM DIALYSATUM.

DIALYZED IRON.

SOURCE.—By heating a solution of Ferric Chloride with Ammonia, Ferric Hydrate being precipitated, this being redissolved by agitation, is placed in a dialyzer and suspended in water, which is renewed so long as it shows a trace of Hydrochloric Acid.

CHARACTERS.—A reddish-brown liquid, free from astringent, styptic taste.

COMPOSITION.—Its composition varies from Fe_2Cl_6, $12Fe_2O_3$ to Fe_2Cl_6, $95\ Fe_2O_3$, and is a 10 per cent. solution of Ferric Oxychloride in water.

Dose, 10 to 30 m.; .60 to 2.00 c.c.

USES.

In arsenical poisoning a dose of common salt or of sodium bicarbonate, followed by 1 fl. oz.; 30 c.c., of dialyzed iron diluted with water, is efficient. It is not considered an eligible iron preparation.]

[GUAIACOLUM.]

GUAIACOL.—[$C_6H_4OHOCH_3$=[123.71.] *Synonym.*—Methyl Pyrocatechin. A liquid constituting from 60 to 90 per cent. of Creosote (*see* p. 286), which is mainly composed of this and Creosol.

SOURCE.—By fractional distillation of Beech-wood Tar; treated with Ammonia to remove acid compounds, and then again fractionated

CHARACTERS.—A colorless, highly refractive liquid, of a strongly aromatic odor. Sp. gr., 1.117. *Solubility.*—Very slightly in water, readily in Alcohol and Ether.

Dose, 2 to 10 m.; [.12 to 60 c.c.

GUAIACOLI BENZOAS.—Guaiacol Benzoate. $C_6H_4OHC_6HC_3O_2$= 203.49. *Synonyms.*—Benzosol. Benzoyl Guaiacol.

SOURCE.—This is prepared by adding to an alcoholic solution of Guaiacol, Potassium Hydroxide, forming Potassium Guaiacol, which is heated in a water-bath with Benzoyl Chloride. Benzoyl Guaiacol is formed and purified by recrystallization from Alcohol.

CHARACTERS.—A colorless, odorless and tasteless crystalline powder. *Solubility.*—Almost insoluble in water; readily soluble in Ether and Chloroform.

Dose, 2 to 10 gr.; .12 to .60 gm.

GUAIACOLI CARBONAS.—Guaiacol Carbonate. $(C_6H_4OCH_3)_2CO_2$ =257.39.

SOURCE.—By passing phosgene gas ($COCl_2$) into Guaiacol, previously dissolved in a Soda solution. The carbonate is obtained by crystallization.

CHARACTERS.—A white, neutral crystalline powder, almost odorless and tasteless. *Solubility.*—Insoluble in water; soluble in Ether and Chloroform.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

GUAIACOLI SALICYLAS.—Guaiacol Salicylate. $C_6H_4OHCO_2$ $C_6H_4OCH_3$ = 243.42.

SOURCE.—By the action of Phosphorus Oxychloride on a mixture of Sodium Guaiacol and Salicylate.

CHARACTERS.—A white crystalline, odorless and tasteless powder. *Solubility.*—Insoluble in water; soluble in Alcohol, Ether and Chloroform.

Dose, 5 to 30 m.; .30 to 2.00 c.c.

Action and Uses.

Guaiacol is used for the same purposes as creosote. It is, however, less likely to irritate the intestinal canal and the kidneys. Benzosol was introduced as a nearly tasteless combination for the administration of guaiacol. In the digestive tract it splits up into guaiacol and benzoic acid. The carbonate and salicylate have been made as substitutes for guaiacol, and are in many cases preferable to it. Local cutaneous applications of guaiacol are believed to reduce a febrile temperature. Since guaiacol is by no means so valuable as creosote, these preparations will have a limited use.]

ICHTHYOLUM.

ICHTHYOL. *Synonym.*—Ammonium Ichthyol Sulphonate.

Source.—A bituminous quartz containing the fossil remains of fish and other animals is distilled with [concentrated Sulphuric Acid, and the distillate is treated with a concentrated solution of Sodium Chloride, whereby the Sulphuric and Sulphurous Acids are removed, while the Sulphonic Acid separates.] This Acid is then saturated with Ammonia.

Characters.—A viscous, reddish-brown, syrupy liquid, having a bituminous odor and taste. *Solubility.*—Soluble in water, Glycerin, oils and fats.

Dose, 10 to 20 gr.; [.60 to 1.20 gm.]

Lithium, Sodium, and Zinc Ichthyol Sulphonates are prepared. [The name Ichthyol is understood to refer to Ammonium Salt.]

Action and Therapeutics.

Ichthyol is chiefly used externally for chronic eczema and psoriasis. An ointment with lanolin and ichthyol 20 to 50 per cent. is easily made. [It has been used in the form of a suppository for chronic prostatitis.] Ichthyol has been given as a pill for chronic rheumatism. [Under the name of *Thiol*, a mixture of sulphuretted hydrocarbons has been used as a substitute of ichthyol, because it is less offensive. It has been applied as an ointment in vaseline, (1 to 8).]

[IODOLUM.

IODOL.—C_4I_4NH=569.01. *Synonym.*—Tetraiodopyrrol.

Source.—From the interaction of Iodine and Pyrrol in Alcoholic solution.

CHARACTERS.—A pale-yellow, bulky powder, odorless and tasteless. *Solubility.*—Insoluble in water; soluble in Alcohol, Ether, and fixed oils.

Dose, ½ to 3 gr.; .03 to .20 gm.

ACTION AND USES.

Iodol was introduced as an antiseptic iodine compound, and is used for the same purpose as iodoform, for which it is the usual substitute. It has been administered internally as a substitute for potassium iodide.]

IRIDINUM.

IRIDIN. *Synonym.*—Irisin. The powdered extractive obtained from the root of *Iris vesicolor*, the blue flag (nat. ord. *Iridaceæ*). *Habitat.*—Britain.

CHARACTERS.—A dark-brown, bitter, nauseous powder.

Dose, 1 to 5 gr.; [.06 to .30 gm.]

ACTION AND THERAPEUTICS.

Iridin is a cholagogue, and as it rarely gripes it may be given when it is required to use a cholagogue preparation daily for some time. It may be combined with calomel, euonymin, podophyllin, and other cathartic purgatives.

LAC.

MILK, ARTIFICIAL HUMAN.

PREPARATION.—Take half a pint [240. c.c.] of skimmed milk, heat it to about 96° F.; [35.5° C.] and put into the warmed milk a piece of rennet an inch [2.5 c. m.] square, or a teaspoonful [4. c.c.] of essence of rennet. Put the milk in a fender, or over a lamp, until it is quite warm. As soon as it is set, remove the rennet, break up the curd into small pieces with a knife, and let it stand for ten or fifteen minutes; the curd will then sink. Then pour the whey into a saucepan and boil quickly. Measure one-third of a pint [160. c.c.] of this whey, and dissolve in it, while it is hot, 110 gr. [7. gm.] of Sugar of Milk. When this third of a pint [160. c.c.] of whey is cold, add to it two-thirds of a pint [320. c.c.] of new milk and two teaspoonfuls; [8. c.c.] of cream and stir. The food should be made fresh every twelve hours, and warmed as required. The piece of rennet, when taken out, can be kept in a cup and used for ten days or a fortnight. Care should be taken to select an essence of rennet which does not make the milk taste.

Action and Therapeutics.

Artificial human milk is invaluable as a food for infants whose mothers cannot suckle them. Many cases of infantile diarrhœa, indigestion, and sickness can be cured by substituting this milk for the usual milk and water, or infants' food. Some large dairy firms supply it, but it is cheaper to make it at home, and the above directions are easily carried out.

MILK PEPTONIZED.

Preparation.—Mix a pint [480. c.c.] of milk with 5 fl. oz. [150. c.c.] of water. Heat to 140° F. [60° C.], and add Liquor Pancreatus (Benger's), 2 fl. dr. [8. c.c.]; or Zymine, [B. P.,] (Fairchild's Extractum Pancreatis), 5 gr. [30. gm.]; and Sodium Bicarbonate, 20 gr.; [1.20 gm.] Leave the mixture at the ordinary temperature of the room for three hours, or if kept at about 135° F. [57.2° C.] for about half an hour, then heat for a moment to boiling-point. This preparation should be kept on ice until required.

Action and Therapeutics.

Peptonized milk is used in many conditions in which it is thought that the gastric digestion is too feeble to digest ordinary milk, or in which it is desired to avoid the curdling of milk in the stomach. Milk should always be peptonized before being introduced into an enema. A usual nutrient enema consists of the yolk of an egg and milk up to four fluid ounces [120. c.c.]. This mixture may be peptonized in just the same way and with the same quantity of peptonizing agents as the pint [480.c.c.] of milk. Thirty grains; [2.00 gm.] of common salt should be added to the enema before use.

[LACTOPHENINUM.

LACTOPHENIN.—$C_{11}H_{15}NO_3 = 208.56$. *Synonym.*—Lactyl-para-phenetidine. $C_6H_4OC_2H_5NHCOCH(OH)CH_3 = 208.56$.

Source.—Lactophenin differs from Phenacetin only by the substitution of Lactic for Acetic Acid.

Characters.—A white, tasteless powder. *Solubility.*—In 330 parts of water.

Dose, 10 to 15 gr.; .60 to 1.00 gm.

Action and Uses.

Lactophenin is an analgesic and antithermic. It is usually better borne than antipyrin. Although it may, in some instances, give rise to sweating, it does not cause collapse nor cyanosis. It produces a considerable and persistent lowering of a febrile temperature, but without abundant perspiration, and its use is not followed by chilly sensations. It has been administered in articular rheumatism, influenza, scarlet fever, septicæmia and other infectious diseases Von Jaksch has obtained excellent results in typhoid fever, with daily doses from 7 to 15 gr.; .50 to 1.00 gm., not only in reducing the fever, but as a sedative when delirium becomes a prominent symptom.

LYSOLUM.

LYSOL.—A substance containing about 50 per cent. of Cresol.

Source.—From tar-oil, by dissolving in fat and saponifying with Alcohol.

Characters.—A brown, oily-looking, clear liquid, with a feebly aromatic odor. *Solubility.*—Soluble in all proportions in water, forming a clear frothing, saponaceous liquid; in Alcohol, Chloroform and Glycerin.

Action and Uses.

Lysol is an antiseptic, about one-eighth as poisonous as carbolic acid, and one-half as poisonous as creolin, used in from one-half to two per cent aqueous solution. The literature is extensive and generally favorable.]

[MALTUM.]

MALT. *Synonym.*—Byne. The seed of common barley, *Hordeum distichum* (nat. ord. *Graminaceæ*), caused to enter the incipient state of germination by artificial means, and dried. It contains the ferment diastase, which can convert starch into Dextrine and Maltose. Thus 10 $(C_6H_{10}O_5)n+4nH_2O$ $=4nC_{12}H_{22}O_{11}$, Maltose $+ (C_{12}H_{20}O_{10})n$, Dextrin.

Characters.—Is sweet, thick, brownish liquid, like honey. It forms an emulsion with oils.

Composition.—This varies very much. The chief constituent is Maltose ($C_{12}H_{22}O_{11}$); there is also some *Dextrin* ($C_{12}H_{20}O_{10}$), a ferment (destroyed by boiling), Albumin, the salts of barley, and

Preparation.

Extractum Malti.—[Extract of Malt. By maceration, dilution with water, straining and evaporation *in vacuo* of the strained liquid. Dose, 1 to 4 fl. dr.; 4. to 15. c.c.]

Action and Therapeutics.

Maltose is a very valuable food, especially for persons who are suffering from wasting diseases, and have a feeble digestion. It is easily retained by the stomach, even when, as often is the case in phthisis, other food, especially cod liver oil, is rejected. In such a case a malt extract is an excellent substitute for cod liver oil. Maltose as a food leads to the formation of fat. The diastase contained in the malt extract, acting upon the starch in farinaceous food, converts it into dextrin and maltose, and thus, if the secretion of saliva and pancreatic juice is feeble, the malt to some extent supplies their place. Like the ferments in pancreatic juice and saliva, diastase can only act in an alkaline medium, and therefore should not be given until, at least, two hours after a meal. Emulsions of cod liver oil in it are frequently useful. A mixture of extract of malt and iron is also valuable (ferric pyrophosphate, 2; water, 3; dissolve and add extract of malt, 95. Dose, 1 to 4 fl. dr. [4 to 15 c. c.]).

[METHYLENE BLUE.

METHYLENE BLUE. *Synonym.*—Tetramethyl Thionin-Chloride. $C_{16}N_{18}N_3SCl = 318.90$.

Source.—By treating dimethylparaphenylenediamine ($NH_2C_6H_4N(CH_3)_2$) in an acid solution with Hydrogen Sulphide and Ferric Chloride.

Characters.—In small, blue, scaly crystals, with a copper-bronze tinge. *Solubility.*—Readily in water.

Dose, 1 to 5 gr.; .06 to .30 gm.

Action and Uses.

Methylene blue (not to be confounded with methyl blue) has been used for rheumatism of the joints and muscles. Lately it has been given for intermittent fevers, but the reports show that it possesses no advantages over quinine. It imparts a blue color

to nerve substance and a like color to the urine. It may produce irritation at the neck of the bladder, which about 30 gr.; 2 gm. of powdered nutmeg is said to relieve. The Pyoktanins (the blue intended for general surgery, and the only one employed to any extent, and the yellow more especially for ophthalmic practice), two other aniline dyes, have been introduced into medicine as antiseptics. They have also been used by injection into inoperable neoplasms, sarcomata, epitheliomata; but while it is believed that, by them, a cure is not impossible, no definite statements can as yet be made. These remedies must be of absolute purity for internal use.

METHYLENUM DICHLORIDUM.

MENTHYLENE DICHLORIDE.—$CH_2Cl_2 = 84.71$. *Synonyms.*—Dichlormethane. Methylene Bichloride.

SOURCE.—By exposing to sunshine, in a glass globe, pure Chlorine and gaseous Methyl Chloride.

CHARACTERS.—A colorless liquid, having a chloroform-like odor. Sp. gr., 1.344.

Dose, 10 to 30 m.; .60 to 2.00 c.c.

USES.

Methylene dichloride is a powerful anæsthetic, producing narcosis more rapidly and of longer duration than other anæsthetics, passing off, however, with great suddenness. It is believed to more evenly influence the circulation and respiration and to affect the muscular sensibility less than other and similar drugs. The pure drug is explosive, and later investigations have not confirmed the advantages claimed for it by Richardson. Several deaths have been produced by it.

MUSCARINA.

MUSCARINE.—$C_5H_{15}NO_3 = 136.74$. An alkaloid obtained from *Amanita Muscaria*, Fly Fungus. *Habitat.*—Russia and Northern Europe.

CHARACTERS.—A liquid of the consistence of syrup, without odor or taste. *Solubility.*—Nearly in water and Alcohol; insoluble in Ether and Chloroform.

Dose, ⅛ to 2 gr.; .998 to .12 gm.

Action and Uses.

Muscarine in its action somewhat resembles calabar bean, and it is antagonistic to atropine. It produces free salivation, abundant perspiration, diminution of the force and frequency of the pulse, dyspnœa, paralysis and finally death. The pupil is contracted; dilating, however, before death. The cardiac diastole is prolonged, due to action upon the inhibitory nerves. The muscles of the intestines and bladder are markedly contracted. The abdominal secretions are increased. Although it has been but little used in medicine, it is likely to be useful in intestinal torpor, duodenal catarrh, and in inflammatory effusions and exudations. As it produces contraction of pulmonary capillaries, it is indicated in pulmonary hæmorrhages and incipient pulmonary congestion.]

OPIUM.

OPIUM. The following non-official preparations are used:—*Liquor Opii Sedativus* (Battley's solution), about 50 per cent. stronger than Laudanum. *Acetum Opii Crocatum* (black drop), four times as strong as Laudanum.

[The following alkaloids are sometimes used:—*Thebaine.* $C_{19}H_{21}NO_3$. *Synonym.* Paramorphine. It is contained in Opium, 0.15 to 1 per cent. In silvery scales or hard prisms, odorless and having a bitterish taste. Soluble in Ether, Alcohol and Chloroform.

Narceine. $C_{23}H_{29}NO_9$. It is contained in Opium 0.1 to 0.7 per cent., and is in long quadrangular prisms, or white, silky needles, sparingly soluble in Alcohol, and in water.

Dose, $\frac{1}{4}$ to $\frac{1}{4}$ gr.; .015 to .045 gm.

Action and Uses.

Narceine closely resembles morphine in its action, but is probably more hypnotic and is not followed by the disagreeable after-effects. Thebaine is rarely used; it resembles strychnine in its action; in dose of one grain; .06 gm, it causes tetanic spasms.

OUABAINUM.

OUABAIN.—$C_{30}H_{46}O_{12}$ -596.62. A glucoside isolated from the root of a tree, said to be the *Carissa Schinperi*. *Habitat.*—Africa.

Characters.—A white, crystalline powder slightly bitter. *Solubility.*—With difficulty in cold water; soluble in Chloroform and Ether.

Dose, $\frac{1}{3}\frac{1}{3}\frac{1}{0}$ gr.; .00013 gm.

USES.

According to Gley it is a local anæsthetic, having ten times the power of cocaine. It has also been recommended for whooping cough. As it is a very powerful drug $\frac{1}{65}$ gr.; .001 gm., when taken into the blood, being sufficient to kill a man, it should be used with great caution.

PENTALUM.

PENTAL.—C_5H_{10}=69.85. *Synonym.*—Trimethylethylene.

SOURCE.—It is obtained from Amylic Alcohol by digestion with Zinc Chloride for twenty-four hours, and fractional distillation.

CHARACTERS.—A colorless liquid, very volatile, insoluble in water, but miscible in all proportions with Alcohol, Ether, and Chloroform; highly inflammable. Sp. gr., 0.620.

ACTION AND USES.

Pental is an anæsthetic, the equal of nitrous oxide in rapidity of action and safety, but superior to it, in its more prolonged action and in having no unpleasant after-effects. Even when insensibility to pain is reached, consciousness is retained sufficiently to respond to commands. The stage of exhilaration is seldom present; it does not lose its effect by repeated inhalations. It differs from chloroform in that it acts more promptly, and has no evil after-effects; from ethyl bromide, in that it is somewhat slower in its action, but is more lasting in its effects, and can be prolonged as may be necessary; from nitrous oxide, in that it can be continued for a longer time, and in its freedom from unpleasant effects and in its safety.

PHENOCOLLI HYDROCHLORIDUM.

PHENOCOLL HYDROCHLORIDE.—$C_{10}H_{14}N_2O_2HCl$=230.01.

SOURCE.—By the intermixture of Phenetidine with Glycocol or Amidoacetic Acid.

CHARACTERS.—It is a white micro-crystalline powder, soluble in 20 parts of water.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

ACTION AND USES.

Phenocoll hydrochloride is not poisonous to animals, and it

does not injuriously affect the blood. It is an antipyretic, not followed by collapse or cyanosis; the perspiration is not stronger than after larger doses of antipyrin. It has also been used as an antineuralgic; in severe acute articular rheumatism it has exercised a beneficial action upon the joints when all other remedies have failed. It is rapidly excreted by the urine, to which it gives a brownish color. The reports, of which there are now a considerable number, are favorable to this remedy.

PIPERAZINUM.

PIPERAZINE.—$C_4H_{10}N_2$=85.9. *Synonyms.*—Piperazidine. Ethylenimine. Diethylene-diamine. Dispermine.

SOURCE.—By the action of Ammonia on Ethylene Chloride. The mixture of bases is fractionated, and from the fraction boiling between 266° F.; 130° C., and 356° F.; 180° C., Piperazine separates on cooling.

CHARACTERS.—It occurs in colorless, well-defined, acicular crystals, readily soluble in water. In cold aqueous solutions, it will dissolve twelve times as much Uric Acid as will Lithium Carbonate.

Dose, 8 to 15 gr.; .50 to 1.00 gm.

ACTION AND USES.

Piperazine is believed to increase the amount of urea, while the uric acid is diminished in the urine. The testimony as to its diuretic action is conflicting. In ordinary doses it does not appear to have any influence upon the system, nor does it irritate the gastro-intestinal or the genito-urinary tract. There is much clinical testimony as to the value of this drug in gout and rheumatism. It may be given hypodermatically. It is so highly hygroscopic that it cannot be administered as pill or powder.

PISCIDIA.

JAMAICA DOGWOOD.—The bark of the root of *Piscidia Erythrina* (nat. ord. *Leguminosæ*). *Habitat.*—West India Islands.

CHARACTERS.—In pieces about 3 mm. in thickness; outer surface of a dark gray-brown; inner surface is of a dark brown color, and very fibrous. It has a disagreeable odor of Opium when broken; taste acrid, and it produces a burning sensation in the mouth.

COMPOSITION.—The chief constituents are—(1) *Piscidin*, $C_{29}H_{34}O_9$, a neutral principle which by recrystallization appears in colorless crystals, insoluble in water, soluble in Chloroform and boiling Alcohol. (2) Resin.

Preparation.

Fluid extract, not miscible with water.
Dose, ½ to 2 fl. dr.; 2. to 8. c.c.

ACTION AND USES.

Jamaica dogwood is a narcotic, which does not affect the irritability of motor, or peripheral ends of sensory nerves, reduces reflex action, dilates the pupil, reduces the frequency of the pulse. It is of value as an anodyne in neuralgia and in nervous insomnia, and, when combined with viburnum, to relieve dysmenorrhæa. Locally it has been applied with success for toothache.

PYRIDINUM.

PYRIDINE.—$C_5H_5N = 78.86$.

SOURCE.—From bone-oil by the action of Sulphuric Acid.

CHARACTERS.—A colorless liquid having a peculiar and lasting odor, and a pungent taste. Sp. gr., 0.980. *Solubility.*—Readily in water.

Dose, 2 to 4 m.; .12 to .24 c.c.

USES.

Administered by inhalation, this drug will frequently relieve the paroxysms of asthma. For this purpose a fluid drachm; 4 c.c., is necessary, placed in a dish, so that it may slowly evaporate. Its persistent and abominable odor is a great obstacle to its use.

SALOPHEN.

SALOPHEN.—$C_6H_4(OH)CO_2C_6H_4NHCOCH_3 = 270.40$. *Synonym.* Acetylpara-amidophenol Salicylate.

SOURCE.—From Paranitrophenol Salicylate by a complicated process, purifying by crystallization from Alcohol.

CHARACTERS.—Minute white scales, free from odor or taste. It contains 50.9 per cent. of Salicylic Acid. *Solubility.*—Almost insoluble in water; freely soluble in alkalies, Alcohol and Ether.

Dose, 5 to 15 gr.; .30 to 1.00 gm.

ACTION AND USES.

In a warm alkaline solution salophen is broken up into salicylic acid and acetylparamidophenol, the latter being harmless.

It is decomposed in the intestines, even when given hypodermatically. It is used as a substitute for salicylic acid in acute rheumatism, and as an intestinal antiseptic. It is probably quite as efficient and much safer than salol.]

SANITAS.

SANITAS.—The oleoresin common Turpentine (*see* p. 446) obtained from *Pinus Sylvestris*, the common Scotch fir, is allowed to oxidize in the air. Sanitas is the aqueous solution of this oxidized Turpentine. Its active, antiseptic principle is hydrogen dioxide. It also contains little Thymol and a Camphor.

Action and Therapeutics.

It is a pleasant-smelling, non-poisonous liquid, which may be used as a domestic antiseptic and disinfectant, but is not so powerful as carbolic acid or as [corrosive mercuric chloride].

SOJA.

SOJA BEANS.—The beans of *Soja hispida*. [*Habitat.*=Japan; cultivated in Southern Asia.

Composition.—Soluble Casein, 30; Albumin, 0.5; insoluble Casein, 7; fat, 18; Cholesterin, 2; water, 10; Dextrin, 10; Starch, 5; Cellulose, 5; Ash, 5; a powerful amylolytic ferment. These are powdered and made into a flour, from which bread and biscuits are prepared.] The flour contains but very little starch or sugar, sometimes not more than 2 or 4 per cent.

Action and Therapeutics.

Bread and biscuits made from the flour are used in the treatment of diabetes as a substitute for gluten bread; and many patients prefer the taste. They are quite as efficacious in reducing the amount of the sugar passed in the urine.

[THEOBROMINÆ SODIO-SALICYLAS.

THEOBROMINE SODIO-SALICYLATE. — $C_7H_7NaN_4O_2 + NaC_7H_5O_3 = 361.42$.] *Synonym.*—Diuretin.

Source.—By the interaction of Sodium Theobromine and Sodium Salicylate. It corresponds to the Caffeine Sodio-Salicylate, the salt of Caffeine most used in Germany, and contains [49.7] per cent. of Theobromine.

[Characters.—A white powder, soluble in half its weight of warm water, the solution remaining perfect when cooled.

Dose, 15 to 30 gr.; 1. to 2. gm.

Action and Uses.

It is a pure diuretic, without action upon the heart, and it is believed that it does not irritate the kidneys. The daily dose is from one to two drachms; 4. to 8. gm., best administered in solution with aromatic water. It has been administered with benefit in cases of severe cardiac or hepatic dropsy.] It is said that it does not produce depression, but it has occasionally given rise to severe symptoms, [which may have been due to impurities.]

[THALLINÆ SULPHAS.

THALLINE SULPHATE, $2C_9H_{10}N(OCH_3).H_2SO_4 + 2H_2O = 459.06$.

Source.—By heating together Paramidoanisol, Paranitranisol, Glycerin and Sulphuric Acid.

Characters.—White or whitish granular crystalline powder having a slightly Anise-like odor and a nauseous, bitter, saline and pungent taste. *Solubility.*—In 7 parts of water; in 100 parts of Alcohol.

Dose, 2 to 10 gr.; .12 to .60 gm.

Action and Uses.

It is rarely given internally, because it is poisonous to the red blood-corpuscles and to the nervous system. Its chief use is an injection for gonorrhœa, in aqueous solution (1 or 2 to 120), or it can be used in a 2 per cent. solution as gelatin bougies.]

TONGA.

TONGA.—[The bark of *Raphidorphora vitiensis* (nat. ord. *Araceæ*) and *Premna taitensis* (nat. ord. *Verbenaceæ*). *Habitat.*—Fiji Islands.

Composition.—The chief constituents are:—(1) *Tongine*, a volatile alkaloid. (2) A volatile oil.]

Dose, ¼ to 1 dr.; [1. to 4. gm.]

[*Preparation.*

Fluid Extract; Dose, ¼ to 1 fl. dr.; 1. to 4. c.c.]

Action and Therapeutics.

Tonga undoubtedly relieves some cases of intractable neuralgia, but unfortunately it is expensive.

APPENDIX No. III.

THE PHARMACOPEIAL VEGETABLE DRUGS ARRANGED ACCORDING TO THEIR NATURAL ORDERS.

Nat. Order.	Name of Plant.	Part of Plant.	Name of Drug.
Algæ	Chondrus crispus	Plant	Irish moss.
	Gigartina mamillosa	"	"
Anacardiæ	Pistacia Lentiscus	Resinous exudation	Mastic.
	Rhus glabra	Fruit	Rhus glabra.
	" radicans	Leaves	Poison Ivy.
Apocynaceæ	Apocynum cannabinum	Root	Canadian Hemp.
	Aspidosperma Quebracho-blanco	Bark	Quebracho.
	Strophanthus hispidus	Seed	Strophanthus.
Aroideæ	Acorus Calamus	Rhizome	Sweet Flag.
Aristolochiaceæ	Aristolochia Serpentaria	Rhizome and roots	Serpentaria.
	" reticulata	" "	"
Asclepiadeæ	Asclepias tuberosa	Root	Pleurisy Root.
Berberideæ	Caulophyllum thalictroides	Rhizome and roots	Blue Cohosh.
	Podophyllum peltatum	Rhizome and roots	May apple.
Betulaceæ	Betula lenta	Oil from bark	Volatile oil of Betula.
Burseraceæ	Commiphora Myrrha	Gum-resin	Myrrh.
Caprifoliaceæ	Sambucus canadensis	Flowers	Elder.
	Viburnum prunifolium	Bark	Black Haw.
	" Opulus	Bark	Cramp Bark.
Celastrineæ	Euonymus atropurpureus	Bark of root	Euonymus.
Chenopodiaceæ	Chenopodium ambrosioides var. anthelminticum	Fruit	American Worm seed.
	Beta vulgaris	From cane	Sugar.
Compositæ	Anacyclus Pyrethrum	Root	Pellitory.
	Eupatorium perfoliatum	Leaves and flowering tops	Thoroughwort.
	Artemisia pauciflora	Flower-heads	Santonica.
	Calendula officinalis	Florets	Marigold.
	Anthemis nobilis	Flower-heads	Chamomile.
	Grindelia robusta	Leaves and flowering tops	Grindelia.
	" squarrosa	Leaves and flowering tops	"
	Matricaria Chamomilla	Flower-heads	German Chamomile
	Tanacetum vulgare	Leaves and tops	Tansy.
	Artemesia Absinthium	" "	Wormwood.
	Taraxacum officinale	Root	Dandelion.
	Inula Helenium	Root	Elecampane.
	Arnica montana	Flower-heads	Arnica flowers.
	"	Rhizome and roots	" root.
	Lactuca virosa	Milk juice	Lettuce.
	Erigeron canadense	Oil from herb	Oil of Fleabane.
	Arctium Lappa	Root	Burdock.
Coniferæ	Abies balsamea	Oleoresin from bark	Canada balsam.
	Abies excelsa	Resinous exudation	Burgundy pitch

Nat. Order.	Name of Plant.	Part of Plant.	Name of Drug.
Coniferæ	Pinus palustris	Oleoresin from wood	Tar.
	" "	Oleoresin	Turpentine.
	Juniperus communis	Oil from fruit	Oil of juniper.
	" Sabina	Tops	Savine.
	" Oxycedrus	Distillation of wood	Oil of cade.
Convolvulaceæ	Convolvulus Scammonia	Resinous exudation	Scammony.
	Ipomœa Jalapa	Tuberous root	Jalap.
Cruciferæ	Brassica alba	Seed	White mustard.
	" nigra	"	Black mustard.
Cucurbitaceæ	Citrullus Colocynthis	Fruit	Colocynth.
	Bryonia alba	Root	Bryonia.
	" dioica	"	"
	Cucurbita Pepo	Seed	Pumpkin seed.
	Ecballium Elaterium	Juice of Fruit	Elaterium.
Cupuliferæ	Quercus alba	Bark	White oak.
	" lusitanica	Parasitic excrescences	Nutgall.
	Castanea dentata	Leaves	Chestnut.
	Fagus sylvatica	Wood-tar	Creosote.
Ericaceæ	Arctostaphylos Uva-ursi	Leaves	Uva ursi.
	Chimaphila umbellata	Leaves	Pipsissewa.
	Gaultheria procumbens	Oil from leaves	Oil of wintergreen.
Euphorbiaceæ	Croton Eleuteria	Bark	Cascarilla.
	" Tiglium	Oil from seed	Croton oil.
	Ricinus communis	"	Castor oil.
	Hevea—*sp. indeter.*	Milk-juice	India rubber.
	Stillingia sylvatica	Root	Queen's root.
	Mallotus philippinensis	Glands and hairs from capsules	Kamala.
Filices	Dryopteris Filix-mas	Rhizome	Male fern.
	" marginalis	"	"
Fungi	Claviceps purpurea	Sclerotium	Ergot.
Gentianeæ	Gentiana lutea	Root	Gentian.
	Swertia Chirata	Plant	Chirata.
Geraniaceæ	Geranium maculatum	Rhizome	Cranesbill.
Gramineæ	Agropyrum repens	Rhizome	Couch-grass.
	Zea Mays	Styles and stigmas	Corn-silk.
	"	Fecula of seed	Starch.
	Hordeum distichum	Seed	Pearl barley.
	Saccharum officinarum	From cane	Sugar.
Guttiferæ	Garcinia Hanburii	Gum-resin	Gamboge.
Hamamelaceæ	Liquidambar orientalis	Balsam from bark	Storax.
	Hamamelis virginiana	Leaves	Hamamelis.
Hydrophyllaceæ	Eriodictyon glutinosum	Leaves	Eriodictyon.
Irideæ	Crocus sativus	Stigmas	Saffron.
	Iris versicolor	Rhizome and roots	Blueflag.
Juglandaceæ	Juglans cinerea	Bark of root	Butternut.
Labiatæ	Rosmarinus officinalis	Oil from leaves	Oil of rosemary.
	Salvia officinalis	Leaves	Sage.
	Scutellaria lateriflora	Herb	Scullcap.
	Lavandula officinalis	Oil of flowers	Oil of lavender.
	Hedeoma pulegioides	Leaves and tops	Pennyroyal.
	Mentha piperita	" "	Peppermint.
	" viridis	" "	Spearmint.
	" arvensis	Stereopten	Menthol.
	" canadensis	"	"
	Melissa officinalis	Leaves and tops	Balm.
	Monarda punctata	Phenol from oil	Thymol.
	Thymus vulgaris	" "	"
	" "	Oil from leaves and flowering tops	Oil of thyme.
	Marrubium vulgare	Leaves and tops	Horehound.

[TRIONAL.

TRIONAL. — $CH_3C(SO_2C_2H_5)_2C_2H_5 = 241.56$. *Synonym.*—Diethyl-sulphon-methylethyl-methane.

SOURCE.—It is prepared as is Sulphonal, except that Methyl-ethyl-ketone is used in place of Acetone.

CHARACTERS.—Shining, colorless, odorless crystalline plates, tasteless and odorless. *Solubility.*—In 320 parts of water; readily in Alcohol and Ether.

Dose, 5 to 30 gr.; .30 to 2.00 gm.

ACTION AND THERAPEUTICS.

Trional is a prompt hypnotic, without cumulative action, and it has no injurious or unpleasant after-effects. Apparently the patients do not become habituted to its use. It has been used as a hypnotic and sedative for the insane; for narcotic *habitués*, so far as is known, it is a safe remedy. It is important the daily action of the bowels be secured, otherwise it may give rise to disagreeable after-effects. *Tetronal* is of similar chemical composition and is used for about the same purpose, but in somewhat larger dose.]

URETHANUM.

URETHANE.—[$CO.NH_2.OC_2H_5 = 88.94$.] *Synonyms.*—Ethyl Carbamate. [Ethyl Urethane.

SOURCE.—By the interaction of Urea Nitrate and Ethyl Alcohol; and crystallization on cooling.

CHARACTERS.—Colorless, columnar or tabular crystals; colorless, having a pleasent, saline, somewhat cooling taste. *Solubility.*—In 1 part of water; 0.6 part of Alcohol; 1 part of Ether; 3 parts of Glycerin.

Dose, 5 to 30 gr.; .30 to 2.00 gm.]

ACTION AND USES.

Urethane is used as a hypnotic, and is believed to provide a calm, natural sleep without any disagreeable after-effects. It was formerly more frequently employed.

WOOD WOOL.

WOOD WOOL.—This is finely comminuted pine wood rendered antiseptic with [Corrosive Mercuric Chloride.]

Action and Therapeutics.

It is very absorbent, is used for dressing wounds, and is very popular in the form of diapers (sanitary towels) for use during menstruation or for uterine discharges, or after delivery. It is also used for infants' napkins.

Nat. Order.	Name of Plant.	Part of Plant.	Name of Drug.
[illegible]	[illegible]	Bark of shoots	Chinese Cinnamon
	"	Bark	Saigon "
	" zeylanicum	Bark of shoots	Ceylon "
	" Camphora	Stereoptum	Camphor.
	Sassafras officinale	Bark of root	Sassafras.
	" "	Pith	" Pith.
[illegible]	Astragalus gummifer	Gummy exudation	Tragacanth.
	Acacia Senegal	Gum from stem	Gum Arabic.
	Glycyrrhiza glabra and var. glandulifera	Root	Liquorice.
	Cytisus Scoparius	Tops	Broom.
	Pterocarpus santalinus	Wood.	Red Saunders.
	" Marsupium	Inspissated juice	Kino.
	Toluifera Pereira	Balsam	Balsam of Peru.
	" Balsamum	"	Balsam of Tolu.
	Physostigma venenosum	Seed	Calabar bean.
	Andira Araroba	Neutral principle.	Chrysarobin.
	Cassia acutifolia	Leaflets	Senna.
	" angustifolia	"	"
	" Fistula	Fruit	Purging Cassia.
	Haematoxylon campechianum	Wood	Logwood.
	Tamarindus indica	Pulp of fruit	Tamarind.
	Acacia Catechu	Extract from wood	Catechu
	Copaifera Langsdorffii	Oleoresin	Copaiba.
[illegible]	[illegible] marina	Thallus	Iceland Moss.
[illegible]	Allium sativum	Bulb	Garlic.
	Colchicum autumnale	Corm	Colchicum root.
	"	Seed	" seed.
	Convallaria majalis	Rhizome and roots	Convallaria.
	Smilax officinalis	Root	Sarsaparilla.
	" medica	"	"
	" papyracea	"	"
	Asagraea officinalis	Alkaloids from seed	Veratrine
	Veratrum viride	Rhizome and roots	Veratrum Viride
	Urginea maritima	Bulb	Squill.
	Aloe Perry.	Juice of leaves	Socatrine Aloes.
	" vera	"	Barbadoes "
Linaceæ	Linum usitatissimum	Seed and oil	Linseed.
	Erythroxylon Coca	Leaves	Coca.
Lobeliaceæ	Lobelia inflata	Leaves and tops	Lobelia.
Loganiaceæ	Strychnos Nux-vomica	Seed	Nux vomica.
	Spigelia marilandica	Rhizome and roots	Pink root.
	Gelsemium sempervirens	Rhizome and roots	Gelsemium.
Lycopodiaceæ	Lycopodium clavatum	Spores	Lycopodium.
Lythraceæ	Punica Granatum	Bark of stem and root	Pomegranate.
Magnoliaceæ	Illicium verum	Fruit	Star-anise.
Malvaceæ	Gossypium herbaceum	Hairs of seed	Purified Cotton.
	" "	Bark of root	Cotton root bark.
	" "	Oil from seed	Cotton seed oil
	Althæa officinalis	Root	Marshmallow.
Menispermaceæ	Jateorhiza palmata	"	Calumba.
	Chondrodendron tomentosum	"	Pareira.
	Menispermum canadense	Rhizome and roots	Canadian Moon-seed.
	Anamirta paniculata	Neutral principle from seed	Picrotoxin.

Nat. Order.	Name of Plant.	Part of Plant.	Name of Drug.
Myristicaceæ.....	Myristica fragrans	Arillode of the seed	Mace.
	" "	Seed	Nutmeg.
Myrtaceæ.....	Eugenia aromatica	Unexpanded flowers	Cloves.
	Myrcia acris	Oil from leaves	Oil of Bay.
	Pimenta officinalis	Fruit	Allspice.
	Melaleuca Leucadendron	Oil from leaves	Oil of Cajuput.
	Eucalyptus globulus	Leaves	Eucalyptus.
	" oleosa	Oil from leaves	Oil of Eucalyptus.
Oleaceæ.....	Olea europæa	Oil from fruit	Olive oil.
	Fraxinus Ornus	Exudation	Manna.
Orchideæ	Cypripedium pubescens	Rhizome and roots	Ladies' slipper.
	" parviflorum	Rhizome and roots	"
	Vanilla planifolia	Fruit	Vanilla.
Papaveraceæ	Papaver somniferum	Exudation from capsules	Opium.
	Chelidonium majus	Plant	Celandine.
	Sanguinaria canadensis	Rhizome	Bloodroot.
Pedalaceæ.....	Sesamum indicum	Oil from seed	Benne oil.
Piperaceæ.....	Piper nigrum	Fruit	Black pepper.
	Piper Cubeba	"	Cubeb.
	Piper angustifolium	Leaves	Matico.
Phytolaccaceæ ...	Phytolacca decandra	Root	Poke Root.
	" "	Fruit	" Berry.
Polygaleæ	Polygala Senega	Root	Senega.
	Krameria triandra	"	Rhatany.
	" Ixina	"	"
Polygonaceæ.....	Rheum officinale	"	Rhubarb.
	Rumex crispus	"	Yellow Dock.
Ranunculaceæ....	Aconitum Napellus	Tuber	Aconite.
	Anemone Pulsatilla	Herb	Pulsatilla.
	" pratensis	"	"
	Delphinium Staphisagria	Seed	Stavesacre.
	Cimicifuga racemosa	Rhizome and roots	Cimicifuga.
	Hydrastis canadensis	" " "	Hydrastis.
Rhamneæ.....	Rhamnus Frangula	Bark	Frangula.
	" Purshiana	"	Cascara Sagrada.
Rosaceæ.....	Rosa gallica	Petals	Red rose.
	" centifolia	"	Pale "
	" damascena	Oil from flowers	Oil of rose.
	Rubus villosus	Bark of root	Blackberry.
	" canadensis	" "	"
	" trivialis	" "	"
	" idæus	Fruit	Raspberry.
	Prunus Amygdalus *var.* dulcis	Seed	Sweet almond.
	" " " amara	"	Bitter "
	Hagenia abyssinia	Female inflorescence	Kousso.
	Prunus domestica	Fruit	Prune.
	" serotina	Bark	Wild Cherry.
	Quillaja Saponaria	"	Soap bark.
Rubiaceæ	Coffea arabica	Proximate principle from seeds	Caffeine.
	Cinchona officinalis	Bark	Cinchona bark.
	" Calisaya	"	" "
	" succirubra	"	Red cinchona.
	Cephælis Ipecacuanha	Root	Ipecac.
Rutaceæ	Xantholylum americanum	Bark	Prickly ash.
	" Clava Herculis	"	" "
	Citrus vulgaris	Rind of fruit	Bitter orange peel
	" Aurantium	" "	Sweet " "

Nat. Order.	Name of Plant.	Part of Plant.	Name of Drug.
Rutaceæ.	Citrus Limonum	Rind of fruit	Lemon peel.
	" "	Juice "	" juice.
	" Bergamia	Oil from rind of fruit	Oil of bergamot.
	Barosma betulina	Leaves	Buchu.
	" crenulata	"	"
	Pilocarpus Selloanus	Leaflets	Jaborandi.
	" Jaborandi	"	"
Salicaceæ	Salix *sp. indet.*	Neutral principle	Salicin.
	Populus *sp. indet.*	" "	"
Santalaceæ	Santalum album	Oil from wood	Oil of Santal.
Sapindaceæ	Paullinia Cupana	Seeds	Guarana.
Scitamineæ	Elettaria repens	Fruit	Cardamom.
	Zinziber officinale	Rhizome	Ginger.
Scrophularineæ	Digitalis purpurea	Leaves	Digitalis.
	Veronica virginica	Rhizome and roots	Culver's Root.
Simarubeæ	Picræna excelsa	Wood	Quassia.
Solanaceæ	Capsicum fastigiatum	Fruit	Capsicum.
	Atropa Belladonna	Root and leaves	Belladonna.
	Datura Stramonium	Seed and leaves	Stramonium.
	Hyoscyamus niger	Leaves and flowering tops	Henbane.
	Solanum Dulcamara	Branches	Bittersweet
	Nicotiana Tabacum	Leaves	Tobacco.
Sterculiaceæ	Theobroma Cacao	Oil from seed	Oil of theobroma.
Styraceæ	Styrax Benzoin	Balsamic Resin	Benzoin.
Ternstroemiaceæ	Thea sinensis	Proximate principle from leaves	Caffeine.
Thymelæceæ	Daphne Mezereum	Bark	Mezereum.
Umbeliferæ	Conium maculatum	Fruit	Hemlock.
	Pimpinella Anisum	"	Anise.
	Carum Ajowan	Phenol from oil	Thymol.
	Ferula fœtida	Gum-resin from root	Asafetida.
	Ferula Sumbul	Root	Sumbul.
	Dorema Ammoniacum	Gum-resin	Ammoniac.
	Coriandrum sativum	Fruit	Coriander.
	Fœniculum capillaceum	"	Fennel.
	Carum Carvi	"	Caraway.
Urticaceæ	Humulus Lupulus	Strobiles	Hops.
	Ficus Carica	Fleshy receptacle	Fig.
	Ulmus fulva	Inner bark	Slippery Elm.
	Cannabis sativa	Flowering tops	Indian cannabis.
Valerianeæ	Valeriana officinalis	Rhizome and roots	Valerian.
Vitaceæ	Vitis vinifera	From juice of fruit	White wine.
	" "	" " "	Red "
Zygophylleæ	Guaiacum officinale	Heart wood	Guaiacum wood.
	" "	Resin	Guaiac.
	" sanctum	Wood	Guaiacum wood.]

APPENDIX No. IV.

A LIST OF LATIN PHRASES COMMONLY USED IN THE WRITING OF PRESCRIPTIONS.

aa.	Ana	of each.
Ad.	Adde	add.
Ad lib.	Ad libitum	to the desired amount.
Ad us.	Ad usum	according to custom.
Æq.	Æquales	equal.
[Alt. hor.	Alternis horis	every other hour.
Ampul.	Ampulla	a large bottle.]
Aq.	Aqua	water.
Aq. bull.	Aqua bulliens	boiling water.
Aq. dest.	Aqua destillata	distilled water.
[Aq. ferv.	Aqua fervens	hot water.
Aq. fluv.	Aqua fluviatilis	river water.
Aq. font.	Aqua fontalis	spring water.
Aq. pluv.	Aqua pluvialis	rain water.]
Bib.	Bibe	drink.
Bis. ind.	Bis indies	twice a day.
Bis in 7 d.	Bis in septem diebus	twice a week.
[Bol.	Bolus	a large pill.]
C.	Cum	with.
Cap.	Capiat	let him take.
[Cap.	Capsula	a capsule.
Chart.	Charta	a paper.
Chartul.	Chartula	a small paper.
Col.	Cola	strain.]
C. m.	Cras mane	to-morrow morning.
C. m. s.	Cras mane sumendus	to be taken to-morrow morning.
C. n.	Cras nocte	to-morrow night.
Cochl.	Cochleare	spoonful.
Cochl. ampl.	Cochleare amplum	a table-spoonful.
Cochl. infant.	Cochleare infantis	a teaspoonful.
Cochl. mag.	Cochleare magnum	a table-spoonful.
Cochl. mod.	Cochleare modicum	a dessert-spoonful.
Cochl. parv.	Cochleare parvum	a teaspoonful.
Contin.	Continueter	let it be continued.
Cuj.	Cujus	of which.
C. v.	Cras vespere	to-morrow evening.
Cyath.	Cyathus	a glassful.
Cyath. vinos.	Cyathus vinosus	a wine glassful.
D.	Dosis	a dose.
d.	Da	give.
D. d in d.	De die in diem	from day to day.
Det.	Detur	let it be given.
Dieb. alt.	Diebus alternis	on alternate days.
Dim.	Dimidius	one-half.
Div.	Divide	divide.
D. in p. æ.	Divide in parts æquales	divide into equal parts.
Exhib.	Exhibiatur	let it be given.
F. or ft.	Fiat	let it be made.
F. h.	Fiat haustus	make a draught.
F. m.	Fiat mistura	make a mixture.
F. pil.	Fiat pilula	make a pill.
[Form.	Formula	a prescription.
F. s. a.	Fac secundem arten	make according to art.]
Gtt.	Gutta or guttæ	drop or drops.
Habt.	Habeat	let him have.

Hor. intermed.	Horis intermediis	at intermediate hours.
H. s.	Horâ somni	at bedtime.
Ind.	Indies	daily.
Lat. dol.	Lateri dolenti	to the painful side.
[Mic. pan.	Mica panis	bread crumb].
Mit.	Mitte	send.
Mod. præscript.	Modo præscripto	in the manner directed.
[Non repetat,	Non repetatur	let it not be repeated.]
O. m.	Omni mane	every morning.
Omn. bih.	Omni bihorâ	every two hours.
Omn. hor.	Omni horâ	every hour.
O. n.	Omni nocte	every night.
P. or pt.	Perstetur	continue.
Part. æq.	Partes æquales	equal parts.
[Penicil. cam.	Penicillum camelinum	a camel's hair pencil.
Pil.	Pilula.	a pill.]
P. r. n.	Pro re natâ	when required.
Q. l.	Quantum libet	as much as is requisite.
Q. s.	Quantum sufficit	a sufficient quantity.
Q. v.	Quantum volueris	at will.
R.	Recipe	take.
Rep.	Repetatur	let it be repeated.
Sing.	Singulorum	of each.
[Si op. sit.	Si opus sit	if necessary.]
Sum.	Sumat or sumendum	let him take or let it be taken.
T. d.	Ter in die	three times a day.
[Ter.	Tere	Rub.
Ter. bene.	Tere bene.	Rub well.]

INDEX.

[In all Latin titles of more than one syllable, the accented syllable is distinguished by the sign ' placed after the corresponding vowel.

ABBREVIATIONS, 43, 44, 665.
Absinthe, 483.
Absinthic acid, 483.
Absinthin, 483.
Absin'thium, 483.
Absinthol, 483.
Abstra'cta, 35.
Abstracts, 35.
Absolute alcohol, 250.
Absorbent cotton, 577.
Aca'cia, 533.
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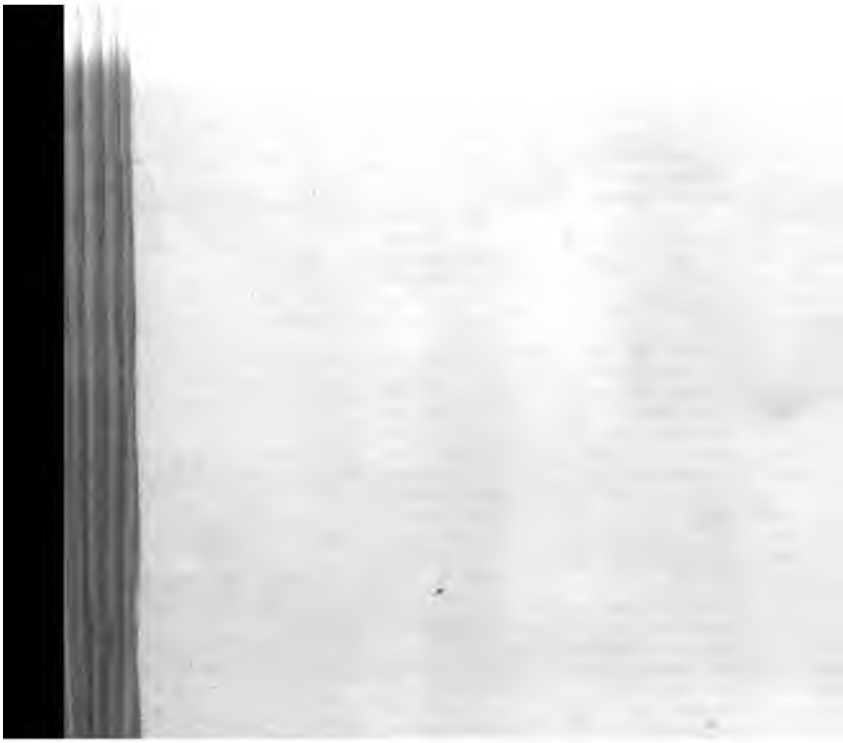

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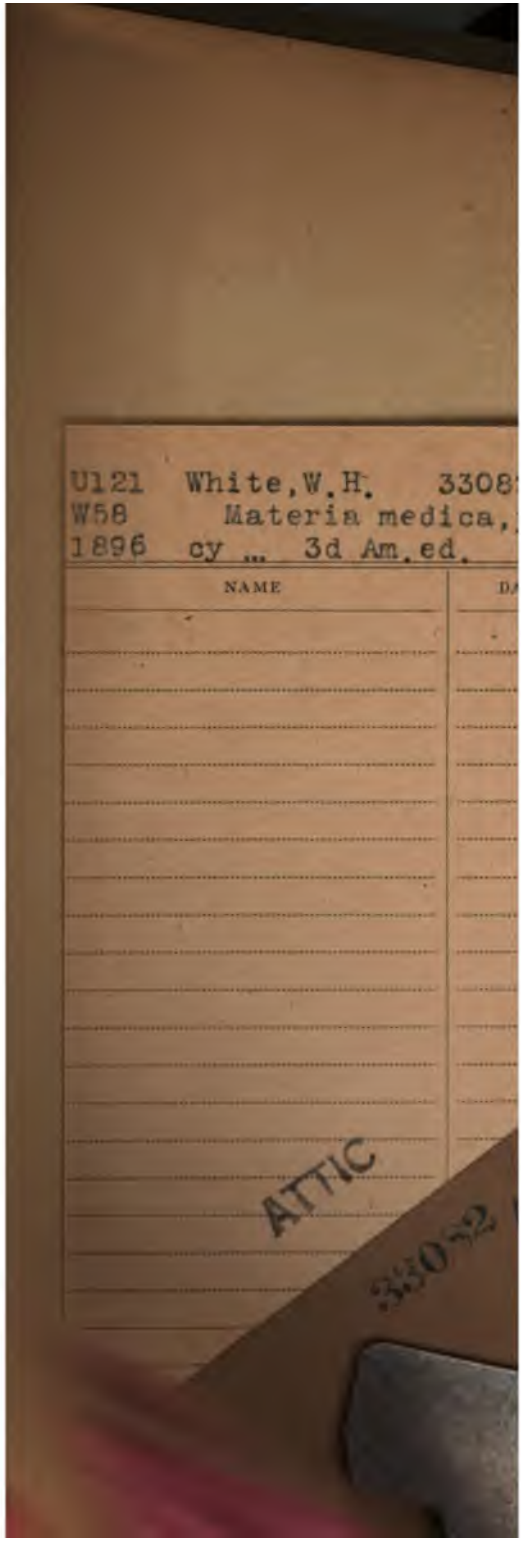
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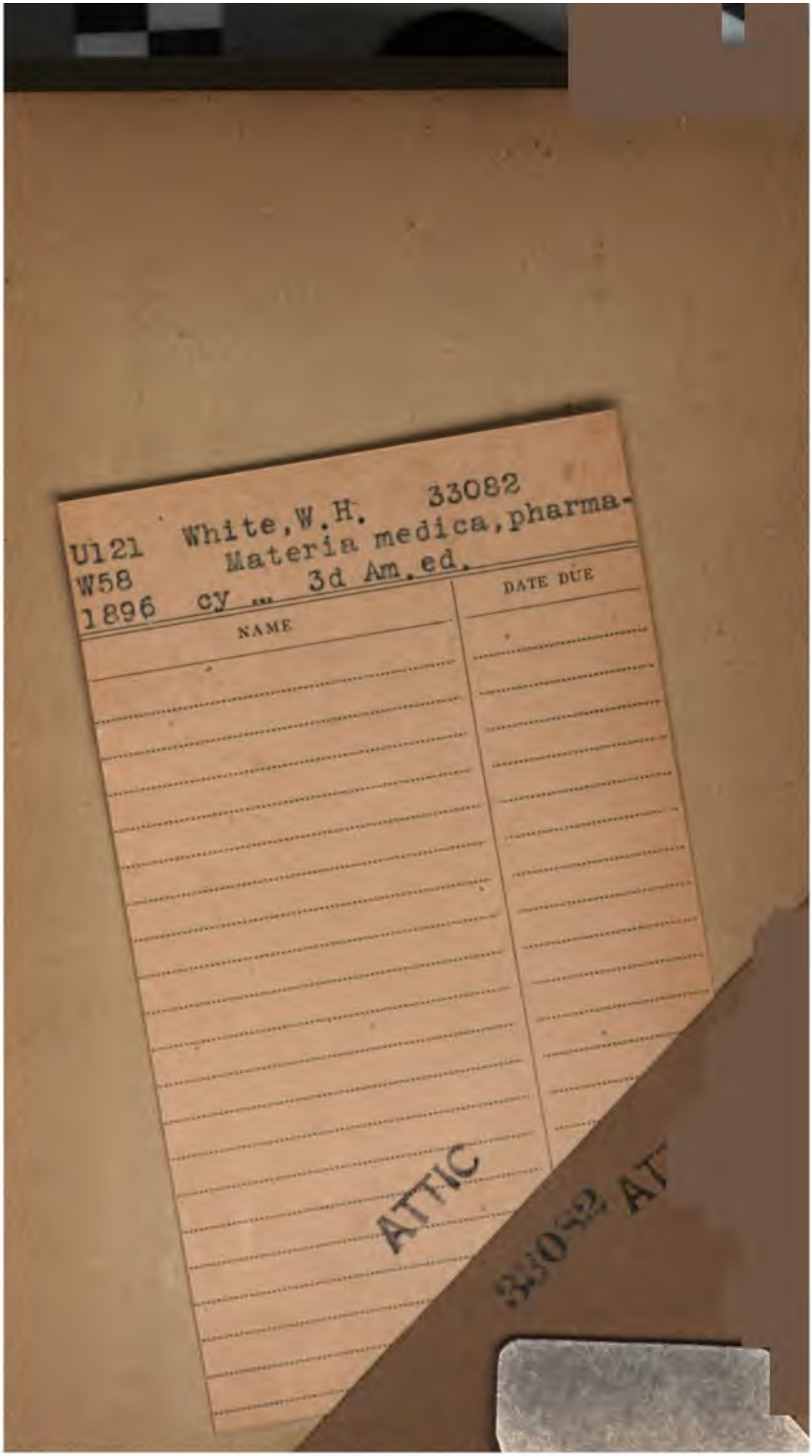
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